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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 628

Contribution from the Bureau of Animal Industry
A. D. MELVIN, Chief

Washington, D. C. ▼ January 28, 1918

WINTERING AND FATTENING BEEF CATTLE IN NORTH CAROLINA

By

W. F. WARD
Animal Husbandry Division, Bureau of Animal Industry

AND

R. S. CURTIS and F. T. PEDEN
Of the North Carolina Agricultural Experiment Station

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INTRODUCTION.

In the fall of 1913 the Bureau of Animal Industry, United States Department of Agriculture, in cooperation with the North Carolina Agricultural Experiment Station, began a series of extensive beef-cattle experiments on the farm of T. L. Gwyn, in Haywood County, N. C. The work was located in the western part of the State because of the wide range of adaptation, applying not only to North Carolina, but also to a number of surrounding States. The western part of North Carolina is extremely mountainous and rough, presenting a problem of peculiar importance to the farmer or cattle grower. The extremely rough character of the region makes good grazing ample when the land is properly cleared and seeded. The area available for the growing of crops for winter maintenance is restricted, however, because of the mountainous condition, and this makes the first three divisions of the experiments reported herein of unusual importance to the stock grower.

The subject discussed, comprising three years' experimental work, consists of: (*a*) Wintering steers in barns and on pasture preparatory to grazing on pasture either alone or in combination with cottonseed cake; (*b*) wintering steers on pasture preparatory to summer

grazing; (*c*) the summer fattening of steers on grass and cotton-seed cake; and (*d*) the winter fattening of beef cattle.

The significance of these problems to the stock grower under the conditions mentioned will be brought out clearly in the discussions which follow. It is strikingly illustrated in the division dealing with the wintering of steers on grass. When there is not enough feed available for wintering as many cattle as can be grazed during the summer, the farmer is losing money, for all his grass can not be utilized during the grazing season. The experiments have proved beyond a doubt that steers can be wintered most satisfactorily on specially prepared winter pastures, and at a cost from 30 to 50 per cent less than upon the common farm roughages. This indicates the importance of improved methods of handling cattle and the possibilities of the mountains for cattle raising.

The importance more particularly of the pasture work in the mountainous part of North Carolina and of surrounding States can not be overemphasized, considering the possibilities of winter and summer pasture development. The large areas of cut-over timber lands, such as those used for the winter pastures in this experimental work, would accommodate large herds of beef cattle if properly seeded. Winter pastures and corn silage for winter maintenance will solve many of the difficulties of the cattle grower. The mountainous condition of the region makes the production of stockers and feeders especially practicable because of the larger amounts of pasture that can be utilized and the minimum of winter feeds necessary for the maintenance and growth of such cattle. This may be appreciated by those not acquainted with local conditions by stating that in many of the mountain counties but 5 to 10 per cent of the land can be cultivated, and much of this is hillsides or steep land that should be in grass. The fattening of cattle is less practicable because of the greater amounts of feeds necessary. Where feeds have to be shipped in by rail, as is usually the case with the concentrates, the distance from the railroad stations makes this practice prohibitive for many farmers.

These statements in the main illustrate the conditions under which the work was carried on and why certain parts of it were so outlined and emphasized. Although much of this work will be of value to stock growers in the Piedmont or lower mountain sections, its value is more pertinent to the mountain areas of the section shown in the outline map. (See fig. 1.)

KIND OF STEERS USED.

The steers used in this work were all native cattle raised in western North Carolina. They were a good uniform lot of grade Shorthorn, Aberdeen Angus, and Hereford breeding with a little Devon blood

showing. The cattle were mostly 2-year-old steers, averaging about 800 pounds in weight in the fall. Most of them had been dehorned previous to their purchase and the remainder were dehorned before being placed in the feed lot. The cattle are charged in all tables and statements at the actual cost per hundredweight.

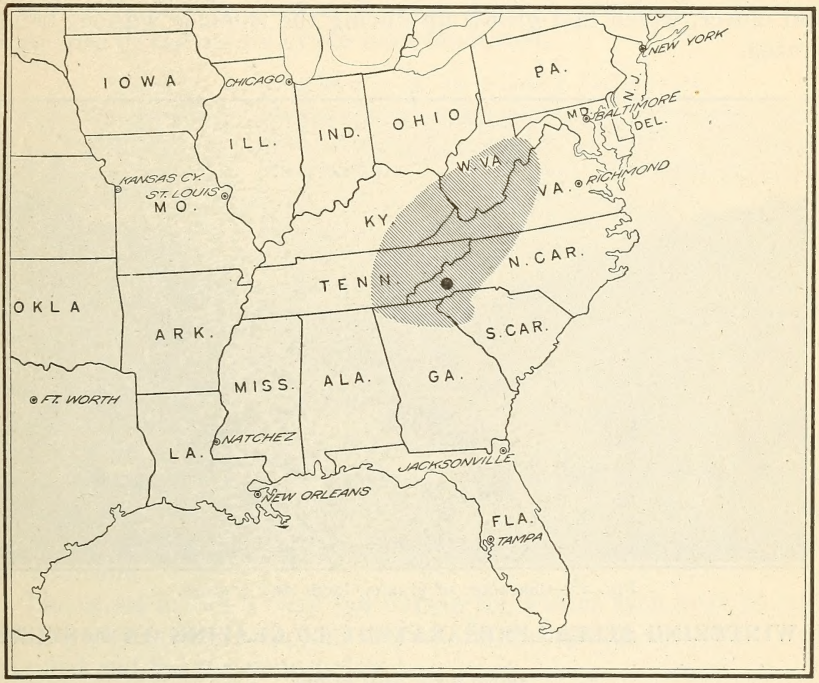

FIG. 1.—Map showing location of experimental work (heavy black dot) and area (shaded) suitable for similar cattle-feeding operations; also principal cattle markets.

CHARACTER AND PRICES OF FEED USED.

Local conditions will determine to a large extent the prices of feeds. In the financial statements for each year the feeds are figured at actual cost, but in all the comparative tables the feeds are figured at an average price for the three years, which is as follows:

Pasture	$1.00 per steer per 28 days.
Cottonseed cake	30.00 per ton.
Corn silage	3.00 per ton.
Hay (alone)	15.00 per ton.
Hay, stover, and straw mixed	10.00 per ton.
Hay and stover mixed	10.00 per ton.
Ear corn	0.83 per bushel.

The feeds used were all of very good quality. The cottonseed cake was cracked on the farm. The only difference between cottonseed cake and cottonseed meal is that the cake is unground. The cake is

much better than meal to feed in the open for several reasons: A sudden rain will not injure cake to such an extent that the steers will not eat it; wind will not blow it away; and it is hard enough so that the steers must chew it, thus preventing greedy ones from eating more than their share, which they could do if meal were fed. The winter pasture consisted of orchard grass, blue grass, herd's grass, and clover, which had grown up during the summer without being grazed.

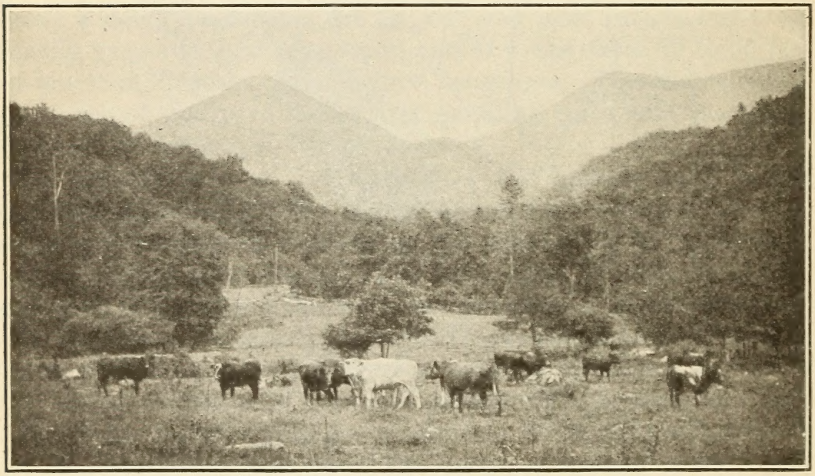

FIG. 2.—Character of grazing lands and pasture.

I. WINTERING STEERS PREPARATORY TO GRAZING ON PASTURE.

OBJECT OF THE WORK.

Most of the cattle in the mountainous section of North Carolina are roughed through the winter, that is, carried on very light rations, and then finished on pasture for feeders the following summer. The experimental work was undertaken in order to determine, first, just how much it costs to carry stock cattle through the winter; second, if it is advisable to allow steers to lose in weight during the winter months; third, to determine not only the best and most economical method of wintering cattle, but also the effect the different methods of wintering cattle have on the way they gain in weight on pasture the following summer.

PLAN OF WORK.

This particular work was planned to cover a period of three years in order to get an average of season, feed, cattle, and condition tending to produce variation. The steers were divided into four lots, using a carload in each lot, and those in each corresponding lot were

fed the same ration each year. The plan was not to make the cattle in the various lots gain in weight, but rather to winter them economically, using light rations even though they lost some weight during the winter, the fattening to be done on grass the following summer. With the amounts of feed used the steers were wintered as well if not better than the average stock cattle are wintered in the mountains.

An outline of the work is given in Table 1 in order to present a clear idea of the nature of the tests conducted.

TABLE 1.—*General plan of the three years' experiments.*

Lot No.	Average number of steers per lot for the 3 years.	Winter feeding.[1]	Summer feeding.[2]
1	24	Ear corn, corn stover, hay, and straw [3]	One-half on grass, one-half on grass and cottonseed cake.
2	24	Corn silage, corn stover, hay, and straw [3]	Do.
3	33	....do.[3]	Grass.
4	19	Winter-grazed, feeding during snows	Do.

[1] From time cattle were taken off pasture in December until turned on pasture about Apr. 15.
[2] From time cattle went on grass in spring to about Sept. 1.
[3] Corn stover and hay were used the first winter.

The cattle in Lot 1 were fed during the winter each year on ear corn and a light ration of corn stover, hay, and straw. These cattle were divided in the spring into Division A, finished on grass alone, and Division B, fed on grass with a small ration of cottonseed cake in addition.

The cattle in Lot 2 were fed during the winter each year on corn silage, corn stover, hay, and straw. In the spring the cattle were divided and fed the same as Lot 1.

The steers in Lot 3 were wintered the same as those in Lot 2. The following summer they were all finished on grass.

The steers in Lot 4 were wintered on pasture, getting no feed or shelter except during snows, when they were brought to the barn and fed a small ration of dry roughage or dry roughage and ear corn combined. The pasture on which these cattle were grazed and finished is described on page 15.

METHOD OF FEEDING AND HANDLING THE STEERS.

The steers in Lots 1, 2, and 3 were fed about 8 a. m. and 4 p. m. The steers of Lots 2 and 3 were fed silage alone in the morning and corn stover, hay, and straw in the afternoon. The steers in Lot 1 were given one-half of the corn stover, hay, and straw in the morning and the other half in the afternoon. The ear corn was chopped and given at one feed in the morning.

The corn stover and hay were mixed together in equal quantities and run through a feed cutter before being fed. Where stover, hay, and straw were used, these feeds were mixed, one-third each, and

run through the feed cutter. The steers in Lot 4, on winter pasture, were fed only during snows, when they were brought to the barn and given a small ration of ear corn, corn stover, and hay. As soon as the snow melted they were taken back to pasture. These steers had no shelter at all, other than the natural shelter furnished by trees, thickets, coves, etc. The cattle in the barns were turned out into lots around the barn in the afternoon, and left about three hours if the weather was clear; if the weather was bad, they were left out only long enough to get water. The steers were weighed every four weeks, early in the morning, before being fed and watered.

AMOUNT OF FEED CONSUMED.

In considering the amount of feed consumed, it should be noted that these cattle were getting only maintenance rations sufficient to keep them in good, strong, thrifty condition. Table 2 shows the total amount of feed consumed and the average daily ration per steer during each of three winters.

TABLE 2.—*Average daily rations (three winters).*

Lot No.	Number of steers.	Number of days.	Ration.	Total feed per steer.	Daily feed per steer.
			1913–14.		
				Pounds.	*Pounds.*
1	25	128	Ear corn [1]	276	2.15
			Corn stover and hay [1]	1,250	9.76
2	25	128	Corn silage [1]	2,041	15.95
			Corn stover and hay [1]	665	5.19
3	35	123	Corn silage	2,006	16.31
			Corn stover and hay	605	4.92
4	17	112	Winter pasture [2]		
			1914–15.		
1	24	131	Ear corn [3]	391	2.99
			Corn stover, hay, and straw [3]	1,434	10.95
2	24	131	Corn stover, hay, and straw [4]	789	6.03
			Corn silage [4]	1,807	13.80
3	31	131	Corn stover, hay, and straw [4]	791	6.04
			Corn silage [4]	1,717	13.11
4	26	131	Winter pasture [5]		
			1915–16.		
1	24	119	Ear corn	374	3.14
			Corn stover, hay, and straw	1,358	11.41
2	24	119	Corn silage	2,142	18.00
			Corn stover, hay, and straw	714	6.00
3	33	119	Corn silage	2,142	18.00
			Corn stover, hay, and straw	714	6.00
4	16	119	Winter pasture [6]		

[1] Fed 2.43 pounds cottonseed cake daily to each steer of Lots 1 and 2 during the last 16 days of experiment.

[2] Each steer of Lot 4 was fed an average of 5.86 pounds of hay for each of 15 days of the winter when the grass was covered with snow. This was charged in cost of wintering.

[3] An average of 1.65 pounds of cottonseed meal was fed to each steer daily for the last 16 days.

[4] Silage was not fed to the steers of Lots 2 and 3 for the last 16 days of the experiment. Stover was fed as the sole roughage with a grain ration of 2.44 pounds of corn and 1.91 pounds of cottonseed meal per head daily.

[5] The steers had to be fed on 24 stormy days, when the grass was covered with snow. During this time each steer consumed a total of 183 pounds of stover and 58.5 pounds of ear corn, which is charged against the cost of wintering.

[6] The steers had to be fed 14 days on account of bad weather. They consumed about 2 pounds of ear corn and 8 pounds of roughage per head per day during that time, which was charged in cost of wintering.

The first section of Table 2 presents the results for 1913–14, when all the cattle were given a very light ration. In the winter of 1913–14 the "dry-fed" cattle (Lot 1) were given a total of 276 pounds of ear corn and 1,250 pounds of corn stover and hay per steer, or a daily ration of 2.15 pounds of ear corn and 9.76 pounds of corn stover and hay. The "silage-fed" cattle in Lot 2 received a total of 2,041 pounds corn silage and 665 pounds corn stover and hay per steer, or a daily feed of 15.95 pounds silage and 5.19 pounds of corn stover and hay.

The cattle in Lot 3, fed like those in Lot 2, were given a total of 2,006 pounds of corn silage and 605 pounds corn stover and hay

FIG. 3.—Character of winter pasture and cattle (Lot 4, 1913–14).

per steer, or a daily feed of 16.31 pounds of corn silage and 4.92 pounds of corn stover and hay. During 15 days of the winter when the grass was entirely covered with snow it was necessary to feed the steers of Lot 4 some dry feed. They were given 88 pounds of hay per steer during this time. This was the only feed these cattle received other than the pasture during the entire winter.

The second section of Table 2 shows the average daily ration and the total feed consumed per steer during the winter of 1914–15, the second year of the experiments. The cattle in Lot 1 consumed 391 pounds of ear corn and 1,434 pounds of corn stover, hay, and straw per steer, or a daily ration of 2.99 pounds of ear corn, and 10.95 pounds of corn stover, hay, and straw.

The cattle in Lot 2 were given a total of 1,807 pounds of corn silage and 789 pounds of corn stover, hay, and straw per steer, or a daily ration of 6.03 pounds of corn stover, hay, and straw, and 13.8 pounds of corn silage per steer.

The cattle in Lot 3 were given practically the same amounts of feed as those in Lot 2. The daily ration consisted of 6.04 pounds of corn stover, hay, and straw, and 13.11 pounds of corn silage per steer. The winter-grazed cattle in Lot 4 were fed a total of 183 pounds of corn stover, hay, and straw, and 58.5 pounds of ear corn per steer. The weather during this winter was very severe at times and the steers in this lot were fed 24 days on account of snows.

FIG. 4.—Steers after wintering on pasture (Lot. 4, 1914–15).

The third section of Table 2 shows the average daily ration and total amount of feed consumed for the winter of 1915–16. During this year the steers in Lot 1 got an average daily ration of 3.14 pounds of ear corn and 11.41 pounds of corn stover, hay, and straw. The steers in Lots 2 and 3 got the same amounts of feed or a daily ration of 18 pounds of corn silage and 6 pounds of corn stover, hay, and straw per steer. The winter-grazed cattle (Lot 4) were fed 29 pounds of ear corn and 128 pounds of corn stover, hay, and straw per steer during the bad weather, which extended over a period of 14 days during the winter.

TOTAL AND DAILY GAINS DURING WINTER.

Table 3 shows the average total gains and the daily gains made per steer during each of the three winters, 1913–14, 1914–15, and 1915–16.

TABLE 3.—*Total and daily gains during three winters.*

Lot No.	Number of steers.	Number of days.	Ration.	Average initial weight per steer.	Average final weight per steer.	Total gain (+) or loss (−) per steer.	Daily gain (+) or loss (−) per steer.
			1913–14.				
				Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1	25	128	Ear corn, corn stover, and hay	769	741	−28	−0.22
2	25	128	Corn silage, corn stover, and hay	770	688	−82	− .64
3	35	123	....do	676	592	−84	− .68
4	17	112	Winter grazed	515	532	+17	+ .15
			1914–15.				
1	24	131	Ear corn, corn stover, hay, and straw	757	725	−32	−0.24
2	24	131	Corn silage, corn stover, hay, and straw	738	710	−28	− .21
3	31	131	....do	677	645	−32	− .24
4	26	131	Winter grazed	705	722	+17	+ .13
			1915–16.				
1	24	119	Ear corn, corn stover, hay, and straw	814	779	−35	−0.29
2	24	119	Corn silage, corn stover, hay, and straw	806	764	−42	− .35
3	33	119	....do	770	730	−40	− .34
4	16	119	Winter grazed	762	788	+26	+ .22

The table shows that in 1913–14 the cattle in Lot 1, fed on ear corn, corn stover, and hay, lost during the winter a total of 28 pounds per steer, equal to a daily loss of 0.22 pound per steer. These steers made the smallest loss of any of the cattle in the barns. The cattle in Lot 2, fed corn silage, corn stover, and hay, lost 82 pounds per head, or a daily loss per steer of 0.64 pound during the winter.

The cattle in Lot 3, which were "short-aged" and lighter in weight, were wintered on the same kinds of feed as those in Lot 2. They lost practically the same per steer, showing a total loss of 84 pounds for the winter and a daily loss of 0.68 pound.

The winter-grazed cattle (Lot 4) did not lose weight, but gained 17 pounds per steer, equal to a daily gain of 0.15 pound. In comparing these cattle with those in the other lots there seemed to be a greater difference in their condition than the gains and losses indicated. The steers in Lot 4 were in splendid condition when spring came, whereas those in Lots 2 and 3 were very thin, though still strong and thrifty. However, they were thinner than many buyers of stock cattle would prefer if purchasing for shipment, as the losses in transit probably would have been greater.

During 1914–15 the cattle in Lot 1, which were fed the same as those in Lot 1 the previous year, made a total loss for 131 days during

the winter of 32 pounds per steer or a daily loss of 0.24 pound. These cattle in Lot 1 lost more than any of the cattle in the barn during this winter's work. The silage cattle in Lot 2 lost 28 pounds per steers, equal to a daily loss of 0.21 pound.

The silage cattle in Lot 3 lost practically the same per steer for the winter as those in Lot 1. The cattle in Lot 3 made a total loss per steer of 32 pounds for the winter. There was very little difference in the losses on these three lots of cattle in the barns. The steers in Lot 4 gained 17 pounds per head instead of losing weight as did those wintered in the barns.

During 1915–16 the cattle in Lot 1 were fed the same as those of Lot 1 for the two previous winters. These steers lost a total of 35 pounds per animal for the winter, representing a daily loss of 0.29 pound.

The silage cattle in Lot 2 lost 42 pounds per steer, while those in Lot 3 on the same kind of feed, lost 40 pounds per steer. The dry-fed cattle in Lot 1 this year made the smallest loss of any of the cattle in the barns. The silage cattle in Lot 2 made the largest loss. The winter-grazed cattle in Lot 4 made a gain during the winter of 26 pounds per head. These cattle were in good condition in the spring, after going through the winter on pasture.

Although the cattle in Lots 1, 2, and 3 lost some weight each year, they came through the winter in good, strong, thrifty condition, or in such condition that when put on pasture they would improve from the start and make good gains in weight during the grazing season.

COST OF WINTERING.

Stockmen are interested in the cost of wintering the cattle and their cost per hundredweight in the spring resulting from the winter feeding. This is ascertained by taking the initial cost in the fall, adding the cost of wintering, and dividing this sum by the weight in the spring. This cost in spring per hundred pounds is important to stockmen who want to graze cattle during the summer and do not know whether it would be cheaper to buy cattle in the fall and winter them or whether it would be cheaper to buy them in the spring.

Table 4 shows the number of steers, rations, number of days wintered, fall prices per hundredweight, cost to feed each steer through the winter, and spring cost per hundredweight for each of the three years.

TABLE 4.—*Cost of wintering; fall and spring prices.*

1913–14.

Lot No.	Number of steers.	Number of days wintered.	Ration.	Fall cost per cwt.	Cost to feed each steer through winter.	Spring cost per cwt.
1	25	128	Ear corn, corn stover, and hay	$5.50	$10.10	$7.07
2	25	128	Corn silage, corn stover, and hay	5.50	6.97	7.17
3	35	123	....do	5.00	6.06	6.73
4	17	112	Pasture	4.50	4.66	5.23
			1914–15.			
1	24	131	Ear corn, corn stover, hay, and straw	$6.00	$12.20	$7.96
2	24	131	Corn silage, corn stover, hay, and straw	6.00	7.58	7.30
3	31	131	....do	6.00	7.45	7.43
4	26	131	Pasture	6.00	6.29	6.70
			1915–16.			
1	24	119	Ear corn, corn stover, hay, and straw	$6.00	$11.08	$7.69
2	24	119	Corn silage, corn stover, hay, and straw	6.00	6.78	7.22
3	33	119	....do	6.00	6.78	7.25
4	16	119	Pasture	6.00	5.23	6.60

Feeds were charged for the three years at the following average prices:

Ear corn	$0.83 per bushel.
Cottonseed cake	30.00 per ton.
Corn silage	3.00 per ton.
Hay	15.00 per ton.
Corn stover and hay	10.00 per ton.
Corn stover, hay, and straw	10.00 per ton.
Pasture	1.00 per head per 28-day period.

In 1913–14 the cattle in Lot 1 cost $5.50 per hundredweight in the fall. It cost $10.10 per steer to winter on ear corn, corn stover, and hay, making the cattle cost $7.07 per hundredweight in the spring.

The silage cattle in Lot 2 cost $5.50 per hundredweight in the fall and it cost $6.97 per steer to winter them, or $3.13 per steer less than Lot 1, but the cattle in Lot 2 lost heavily during the winter. The cost per hundredweight for Lot 2 in the spring was $7.17, or 10 cents per hundredweight more than those in Lot 1. The cattle in Lot 3, wintered on the same kind of feeds as those in Lot 2, cost $6.06 per steer to winter, the cost in the spring being $6.73 per hundredweight. The initial cost of these cattle was 50 cents per hundredweight less than those in Lots 1 and 2, as they were lighter cattle. There was very little difference in the spring prices per hundredweight in the cattle in Lots 2 and 3.

The winter-grazed cattle (Lot 4) made a gain during the winter, while all the cattle in the barns lost weight. It cost $4.66 to winter

these steers, while it cost $10.10 per steer to winter those in Lot 1, or more than twice as much. Comparison of the spring prices shows that the steers in Lot 4 cost $0.73 per hundredweight more in the spring than they did in the fall, while those in Lot 1 cost $1.57 more, in Lot 2 $1.67 more, and in Lot 3 $1.73 more. It cost more than twice as much in every case to winter the cattle in the barns as it did to winter those on pasture when the cost of feed and the gain or loss in weight of the cattle are considered.

In 1914–15 it cost $12.20 to winter each steer of Lot 1. The fall cost per hundredweight was $6 and spring cost $7.96. The silage cattle in Lot 2 cost $7.58 per head to winter; the fall cost per hundred pounds was $6 and the spring cost $7.30. The silage-fed cattle in Lot 3 gave practically the same results. The cost of wintering them was $7.45 per hundredweight. It cost $6.29 per steer to winter the cattle in Lot 4. The spring price per hundredweight was $6.70, or an advance of $0.70 per hundredweight over the intial cost in the fall. The advance in the spring price per hundredweight on Lot 1 was $1.96; on Lot 2, $1.30, and on Lot 3, $1.43. The winter-grazed cattle gained in weight while those in the barns lost weight.

During the winter of 1915–16 the dry-fed cattle (Lot 1) cost $11.08 per steer to winter. The spring price of this lot was $7.69, an advance of $1.69 over the fall cost. The cost of wintering the silage cattle in Lots 2 and 3 was $6.78 per steer, and the increased cost in spring was $1.22 and $1.25, respectively, per hundredweight. The winter-grazed cattle (Lot 4), as in previous years, cost less to winter than the cattle in the barns, and at the end of the winter they were heavier than they were the previous fall. It cost $5.23 per steer to winter them, or an advance of only $0.60 per hundredweight over the initial cost.

SUMMARY AND CONCLUSIONS.

Table 5 is a general summary of the three years' work.

TABLE 5.—*Summary of the three winters' work.*

Lot No.	Ration.	Year.	Gain (+) or loss (−) for winter per steer.	Initial cost per cwt.	Cost to winter per steer.	Cost in spring per cwt.	Advance in spring cost over initial cost per cwt.
			Pounds.				
1	Ear corn, corn stover, hay, and straw.	1913–14	−28	$5.50	$10.10	$7.07	$1.57
		1914–15	−32	6.00	12.20	7.96	1.96
		1915–16	−35	6.00	11.08	7.69	1.69
	Average		−32	5.83	11.13	7.57	1.74
2	Corn silage, corn stover, hay, and straw.	1913–14	−82	5.50	6.97	7.17	1.67
		1914–15	−28	6.00	7.58	7.30	1.30
		1915–16	−42	6.00	6.78	7.22	1.22
	Average		−51	5.83	7.11	7.23	1.40

TABLE 5.—*Summary of the three winters' work*—Continued.

Lot No.	Ration.	Year.	Gain (+) or loss (−) for winter per steer.	Initial cost per cwt.	Cost to winter per steer.	Cost in spring per cwt.	Advance in spring cost over initial cost per cwt.
			Pounds.				
3	Corn silage, corn stover, hay, and straw.	1913–14	−84	5.00	6.06	6.73	1.73
		1914–15	−32	6.00	7.45	7.43	1.43
		1915–16	−40	6.00	6.78	7.25	1.25
	Average		−52	5.67	6.76	7.14	1.47
4	Winter pasture	1913–14	+17	4.50	4.66	5.23	.73
		1914–15	+17	6.00	6.29	6.70	.70
		1915–16	+26	6.00	5.23	6.60	.60
	Average		+20	5.50	5.39	6.18	.68

Some important facts brought out by the work and conclusions drawn from it are as follows:

1. The steers in Lots 1, 2, and 3 lost weight each winter, the average loss for the three years being 32, 51, and 52 pounds, respectively; while the steers in Lot 4, which were winter-grazed, gained in weight every year, making an average gain of 20 pounds per head for each of the three winters.

2. The average cost of wintering the steers on dry feeds was $11.13 per head, while the silage-fed steers (Lots 2 and 3) cost $7.11 and $6.76, respectively, and the steers in Lot 4 had a charge of but $5.39 per head against them.

3. There was a saving of over $4 per head by using a combination of silage and dry feeds instead of using the common North Carolina ration of dry roughage with a little ear corn. This emphasizes the importance of silage as a winter feed for stocker cattle.

4. A saving of almost $6 per head was made by using meadows for winter grazing over the method of feeding used for Lot 1.

5. It cost less than one-half as much to winter the steers of Lot 4 as it did those of Lot 1, and the steers of Lot 4 gained in weight while those of Lot 1 lost weight.

6. The average increased cost per 100 pounds of the steers in the spring over the fall cost, due to the different methods of wintering, was $1.74 for Lot 1, $1.40 for Lot 2, $1.47 for Lot 3, and $0.68 for Lot 4. In other words, the farmer who carries steers through the winter under conditions similar to those in western North Carolina can figure that steers wintered on dry feed cost about 1¾ cents a pound more by their spring weight than they did in the fall. Similarly, steers wintered on a light silage ration cost about 1½ cents more, whereas those wintered on prepared winter pastures cost less than ¾ cent more per pound.

The actual increased "worth" or value in the spring of one lot of steers over another depends on how they put on gains the following summer. This will be discussed in Part III of this bulletin.

The value of silage as a winter feed for stocker cattle in mountainous sections is shown by these experiments. A very limited portion of the land can be used for raising crops, and as silage crops make a large tonnage of good feed per acre they will be especially valuable under such conditions.

The results show most conclusively the great importance of prepared meadows or winter pastures for wintering beef cattle. A smaller acreage of pasture was required for wintering a steer than for summer grazing the same steer. In all these experiments, during no winter was more than 2 acres required to winter a steer, and the average amount for the three years was about 1.8 acres. During the summer from 2 to 3 acres were required per steer.

The enormous areas of cut-over mountain lands and lands on which there is timber of practically no value, but which are adapted for cattle grazing can be made a source of a large income and profit without undue or unjustifiable expenditure of money if put into good, permanent pasture. These lands not only furnish excellent winter grazing, but make pastures that are equaled by few in any other part of the United States for fattening cattle during the summer months. This will be presented in Part III of this bulletin, which deals with summer fattening of cattle. The farmer who owns mountain land that has been cut over or is partly covered with timber of little value is overlooking a good opportunity to make money by not converting such lands into good permanent pastures.

II. WINTER GRAZING OF STEERS.

The chief problem in most of the grazing counties in the mountainous areas is the furnishing of sufficient feed to winter stock cattle in a satisfactory manner. Most stock raisers can graze more cattle in summer than they can winter in good condition. One object of this work, therefore, was to determine some method of wintering cattle that would make possible the maintenance of a greater number during the winter months.

The winter-grazing work proved so profitable and satisfactory from every viewpoint that it is given special consideration. The possibilities of using mountain land for winter pasture, the methods of establishing the pastures, and the results obtained from them are discussed below. The report of the results includes the total and daily gains of all the winter-grazed cattle during the three years, the cost of wintering, fall and spring values, and a summary of the whole work. By grouping these facts a more significant idea can be

obtained by the reader regarding the possibilities of this winter-grazing method under his own farm conditions.

ESTABLISHING WINTER PASTURES.

The principal method used in getting the wooded mountain land seeded to grass was as follows:

The coves and flats, which were comparatively free from rocks, were cleared first. A contract was made with the mountaineers, giving them the free use of the land for two years if they would deaden all the large trees, clear out the small brush, and put the land in cultivation, planting corn each year. The land was unfitted for any purpose other than pasture development, some of the mountainous parts being so steep that horses or other work animals could not be led straight up the sides but had to be taken up by a circuitous route. The rows were run around the side of the mountain, following the contour of the land. The land was not plowed deep, as the enormous amount of humus in the soil prevented washing and leaching. From this land from 40 to 60 bushels of corn per acre were produced. The second year, at the last cultivation of the corn, a mixture of 15 pounds of orchard grass, 4 pounds of blue grass, and 7 pounds of timothy and clover per acre, furnished by the owner of the land, were seeded broadcast through the corn. The grass seed soon produced a sod sufficiently firm to prevent any heavy erosion. The orchard grass, which proved to be the best for winter purposes, grew knee high or higher on this land by the fall of the year.

Although this method of cultivating the land in corn before seeding has proved very satisfactory, it is not necessary, as grass seed sown on burnt-over land makes good pasture if the land be dragged and harrowed after seeding. After the pastures were seeded the grass was permitted to grow through the following summer before being used for winter pasture. During this time the grasses grew up and fell over, thus protecting the roots during the winter. Young blades or shoots continued to come out during the early winter and early spring months, furnishing considerable green feed along with the cured forage.

Each year, after seeding, any undergrowth or sprouts that had come up were cut down, but the cost of this was comparatively small. However, it is not advisable to use new land for winter pasture for more than two years in succession before using it for summer pasture. Summer grazing will assist in keeping down sprouts and brush, giving the grasses a better opportunity to form a heavy sod, which is very important under mountainous conditions.

Each succeeding year some new woodland was put in cultivation on this farm in order to have new land for winter pasture and to accommodate the increased number of cattle which it was planned to put on

winter-grazing experiments. By this method the actual cash expenditures for converting the raw woodland into good permanent pasture was the cost of the small amount of seed used, plus the small cost of "sprouting" each year for two or three years. This plan can be used to advantage in nearly all parts of the mountain counties.

The pasture was charged at the rate of $1 per steer for each 28 days.

OBJECT OF THE WORK.

The object of the winter-grazing work was:

(1) To determine the practicability of carrying stock cattle through the winter on grass alone.

(2) To determine a method of wintering that would equalize the number of cattle that could be maintained profitably through both summer and winter.

PLAN OF THE WORK.

This work covered a period of three years. The steers in each lot were kept throughout one year, or until the end of the summer grazing season, when they were sold as feeders. The cattle were bought in the fall and put on winter pasture in late fall, usually some time in December, when the summer grass gave out, which was about the same time the other cattle in the experiment were taken to the barns to be wintered.

No shelter was provided during the winter, as the coves in the mountains furnished ample protection. The cattle were given no feed except during stormy weather, when they were driven to the barn and fed a light feed of hay or ear corn, corn stover, hay, and straw. As soon as the snow melted they were taken back to pasture. In the three years' work it was found that usually there is a period of 10 days to 3 weeks that the cattle will have to be fed. In the spring the cattle in this winter-grazing work were put on summer pasture as soon as it would carry them, usually at the same time the barn-wintered cattle were taken to summer pasture.

KIND OF STEERS USED.

The cattle used in this work were all grade native steers of Shorthorn, Hereford, and Angus breeding with a slight amount of Devon blood in most of them. During the first year's work, 1913–14, the steers used were not as large or as uniform as those used the two following years. The steers of the first year were mostly "short 2-year-olds": those of the last two years were mostly 2-year-olds. All were the same in quality and condition as the cattle used in the barn wintering, with the exception of those of the first year, which were somewhat lighter in weight than the barn-wintered cattle.

AMOUNT OF PASTURE ALLOWED PER STEER.

The average amount of pasture allowed per steer for winter grazing was 2 acres, but in the summer about 3 acres were required to graze a steer to good advantage. No set rule can be given as to the number of acres required to graze a steer either in winter or summer, as the condtioins, such as the slope or exposure of the land, the kind of soil, and its fertility, are so variable in the different sections. The point which the writers wish to emphasize is that less acreage is required to winter graze a stocker for maintenance than to summer graze the same steer to be furnished as a feeder or for butcher purposes. It should be remembered, however, that the object of the winter grazing is simply to maintain or rough a steer through, whereas the summer grazing is for finishing the animal, which requires from 300 to 400 pounds gain to put it in marketable condition.

GAINS DURING WINTER.

Table 6 shows the total and daily gains of the steers on winter pasture.

TABLE 6.—*Total and daily gains of steers on winter pasture.*

Year.	Number of steers.	Days wintered	Ration.	Average initial weight per head.	Average final weight per head.	Total gain per head.	Average daily gain per head.
				Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1913–14	17	112	Winter pasture	515	532	17	0.15
1914–15	26	131	.....do	705	722	17	.13
1915–16	16	119	.....do	762	788	26	.22

During the first winter, 1913–14, as shown in Table 6, the 17 steers made an average total gain of 17 pounds, or a daily gain of 0.15 pound. The second year, 1914–15, the steers made a total gain of 17 pounds per head during the winter, or an average daily gain of 0.13 pound. This shows that there was very little difference in the gains the first two winters. The last winter, 1915–16, the steers did unusually well, making a total gain per head of 26 pounds and an average daily gain of 0.22 pound. When grass came in the spring all these cattle were in good fleshy condition, but the cattle that were wintered in the barn were much thinner in flesh than they were in the fall.

COST OF WINTERING.

The cost of wintering these cattle is one of the most interesting and important factors to consider. This will vary in different localities because of the difference in pastures and cost of feeds used during snowy or stormy weather. The cost of steers per hundred

pounds in the spring, after they have been charged with the purchase price in the fall plus the cost of pasture to carry them through the winter, should be of great interest to farmers and stock raisers. This is the deciding factor as to whether it will be cheaper to purchase cattle in the fall or in the spring for grazing the following summer.

TABLE 7.—*Cost of wintering; fall and spring prices.*

Year.	Number of steers.	Pounds gain per steer for winter.	Initial cost per cwt.	Cost to winter pasture.	Cost in spring per cwt.	Advance in spring over initial cost per cwt.
1913–14	17	17	$4.50	$4.66	$5.23	[1] $0.73
1914–15	26	17	6.00	6.29	6.70	[1] .70
1915–16	16	26	6.00	5.23	6.60	[1] .60

[1] Average, $0.68.

Table 7 shows that there was no great difference in the cost of wintering these cattle during the three years' work. The cattle used the first year were smaller and it did not cost as much per head to winter them, yet the advance in cost per 100 pounds in the spring over the cost in the fall was more than in the following two years' work. The average advance in cost in the spring over that in the fall was 68 cents per hundred pounds, whereas in all the winter cattle work in the barns, as shown in Part I of this bulletin, there was an advance in cost of from $1.40 to $1.70, or an average of $1.55 per hundred pounds. This shows clearly the economy of providing winter pasture.

SUMMARY OF THREE YEARS' WINTER PASTURE WORK.

The steers during the winter of 1913–14 made a total gain of 17 pounds per head at an average cost of $4.66. The next winter the average gain was the same, but the cost per steer was $6.29. During 1915–16 the steers made the largest gains of any in the three years' work, namely, 26 pounds per head, at a cost of $6.60. In this third winter the advance in cost per 100 pounds in the spring over the cost in the fall was $0.60. The average for the three years was $0.68.

CONCLUSIONS FROM WINTER-GRAZING WORK.

Much of the rough mountainous land in western North Carolina should be utilized for winter-grazing purposes. It is practically unfit for any other purpose after the merchantable timber is cut. Winter grazing and the use of the silo will enable stockmen of the mountains to handle more cattle to better advantages through both summer and winter than by the old method of wintering on dry-harvested feeds.

In the experimental work the steers gained an average of 17 pounds per head the first winter, 17 pounds the second, and 26 pounds the third, the average gain being 19 pounds per head for the three years. On the other hand, the dry-fed cattle, wintered in the barns, lost an average of 32.5 pounds per head and the silage-wintered cattle lost an average of 46 pounds during the three years.

These steers required an average of about 2 acres per head for grazing in winter, but in summer stock cattle of similar kind require about 3 acres per head to make proper gains.

The cost per steer to carry the cattle through the first winter was $4.66, the second winter $6.29, and the third winter $5.23, making for the three years an average of $5.39 per head, or approximately half what it cost to dry-feed cattle in the barns. Besides, the last-named steers lost weight.

This work shows that dry-wintered cattle must sell for an average of $1.55 more per hundredweight in the spring than in the previous fall to compensate for the loss in weight and the cost to carry them through the winter. Instead of buying dry-wintered cattle in the spring, it would be much better for stockmen to purchase the steers in the fall if they can furnish winter pasture to carry them through to summer grass. This would mean not only cheaper but also better finished cattle the following fall.

As this work was done under average conditions and covered a period of three years, giving similar results each year, any farmer or stock raiser can expect to get the same results if proper pasture plans are made. This work is entirely practical for any stockman having rough land for pasture purposes.

These cattle were fed only during snows or stormy weather. The first winter they were fed thus 15 days, the second year 28 days, and the third year 14 days, making for the three years an average of a little less than three weeks.

Winter grazing having been found to be the best and most economical method of wintering stock cattle. On the farm where this work was done sufficient winter pasture eventually will be arranged to handle all the stock cattle in this way during the winter.

III. SUMMER FATTENING OF STEERS.

OBJECT OF WORK.

Most of the cattle in this section of North Carolina are finished on grass and sold as feeders when 2 years old. It was thought that the extra finish acquired by feeding cottonseed cake with the grass would make the cattle more readily marketable on butcher markets, making greater discrimination in the quality and finish of cattle than ordinarily is made by buyers. By making a comparison of the two

methods of finishing, the gains of the cattle and the finish acquired could be studied also in relation to the different methods by which the cattle had been wintered.

The object of the summer fattening work was to determine which was the more profitable plan, viz, to finish steers on grass alone or to finish them on grass and cottonseed cake. The steers used had been wintered on various rations, consisting of (1) ear corn, corn stover, and hay; (2) corn stover and corn silage; and (3) winter grass.

PLAN OF WORK.

Table 8 gives a clear idea of how the work was planned.

TABLE 8.—*General plan of summer fattening of steers.*

Lot No.	Average number of steers for the three years.	Method of wintering Dec. 16 to Apr. 15.	Summer feeding, approximately from Apr. 15 to Sept. 1.
1	24	Ear corn, stover, hay, and straw.....	Lot divided, 12 steers on grass, and 12 on grass and cake.
2	24	.....do.....	Do.
3	33	Corn silage, stover, hay, and straw.....	Grass.
4	19	Winter grazed (fed only during snows)..	Do.

The work covered a period of three years. After the steers had been wintered on the different rations as shown, they were carried through the summer on grass, or on grass with cottonseed cake. The first year all the steers in Lots 1 and 2 were fed cake with pasture. The second and third years these lots were subdivided in the spring, half in each lot being allowed grass alone, and the others a small feed of cottonseed cake in the pasture. The steers in Lots 3 and 4 were grazed without feed each summer. The steers in each lot were numbered the same during the summer as in the previous winter's work, so that the records of each lot could be followed from one fall until the next.

KIND OF STEERS USED.

The steers were the same ones used in the wintering experiments. They were mostly 2-year-old grade Shorthorns, Herefords, and Angus, with a small amount of Devon blood. The different lots were as nearly uniform in weight and quality as possible.

CHARACTER AND PRICE OF PASTURE AND COTTONSEED CAKE.

Most of the pastures used had been established for some time: they consisted of a mixture of blue grass, clover, orchard grass, timothy,

and herd's grass, which is a characteristic mixture for this part of the State. The land was rolling and hilly, some of it being very rough and steep, having some of the old dead trees standing. The pastures were charged at the rate of $1 per steer for 28 days.

The cottonseed cake fed was high grade and was used because it is not injured in quality by the rain, the wind will not blow it about, and as the steers must chew the cake they are more likely to get an equal share of it than with cottonseed meal. The difference between the cake and meal is that the cake is unground. The cake was cracked on the farm by running it through a corn-and-cob mill. In the financial statements it is charged at actual cost for each year, but in all the comparative tables it is charged at an average cost of $30 per ton for the three years' work.

METHOD OF FEEDING AND HANDLING STEERS.

The steers were turned on pastures in the spring as soon as the grass would carry them without injury to its subsequent growth. They were given salt once a week, and every four weeks they were driven to the scales and weighed early in the morning. As soon as weighed they were driven back to pasture, never being out more than an hour at a time.

Troughs were provided in the pasture for feeding the cottonseed cake, which was given late in the afternoon. Each steer was numbered by means of an ear tag so that individual records could be kept and the steers of each lot identified.

AMOUNT OF PASTURE AND COTTONSEED CAKE CONSUMED.

The steers were given an average of about 3 acres of pasture per steer during the summer. Table 9 shows the amount of cottonseed cake consumed in each year's work, giving the lot numbers, number of steers, number of days on feed, ration, total amount of cake eaten per steer, and daily feed per steer.

TABLE 9.—*Average total and daily rations, three summers.*

1914.

Lot No.	Number of steers.	Number of days on feed.	Ration.	Cottonseed cake.	
				Total consumed by each steer.	Average daily ration per steer.
				Pounds.	*Pounds.*
1	25	126	Pasture and cottonseed cake	437	3.47
2	25	126	.....do	440	3.49
3	35	165	Pasture only	.....	.....
4	17	177	.....do	.....	.....

TABLE 9.—*Average total and daily rations, three summers*—Continued.

1915.

Lot No.	Number of steers.	Number of days on feed.	Ration.	Cottonseed cake.	
				Total consumed by each steer.	Average daily ration per steer.
				Pounds.	*Pounds.*
1-a	12	140	Pasture only		
1-b	12	127	Pasture and cottonseed cake	530	4.17
2-a	12	140	Pasture only		
2-b	12	127	Pasture and cottonseed cake	530	4.17
3	31	140	Pasture only		
4	26	140	.....do		

1916.

1-a	11	140	Pasture only		
1-b	12	140	Pasture and cottonseed cake	525	3.75
2-a	12	140	Pasture only		
2-b	12	140	Pasture and cottonseed cake	525	3.75
3	33	140	Pasture only		
4	16	140	.....do		

The first section of Table 9, giving the results of the 1914 work, shows that Lot 1 consisted of 25 steers, which were fed 126 days, getting a daily ration of 3.47 pounds of cottonseed cake per steer in addition to the grass. Not 2 contained 25 steers, which were fed almost the same quantity of feed, or a daily ration per steer of 3.49 pounds cottonseed cake for 126 days. Lot 3 contained 35 steers, which were on pasture for 165 days without any cottonseed cake. Lot 4 contained the 17 winter-grazed steers, which were on summer pasture for 177 days without any cottonseed cake.

The second section, giving the results of the 1915 work, shows that the cattle in division "a" of Lots 1 and 2 were on pasture alone for 140 days. The cattle of division "b" of these lots were fed for 127 days with a daily ration of 4.17 pounds of cottonseed cake per steer in addition to the grass. Lots 3 and 4 (Lot 4 being the winter-grazed cattle) were on pasture 140 days without any cottonseed cake.

The third section, giving the results of the 1916 work, shows that all the steers were on pasture 140 days. The steers in division "b" of Lots 1 and 2 were given a daily ration per steer of 3.75 pounds cottonseed cake, or a total of 525 pounds for the season. The remainder of the cattle were given grass only.

TOTAL AND DAILY GAINS.

Table 10 shows the average initial and final weights per head for the steers of each lot, and the total and average daily gains per steer for the three summers.

TABLE 10.—*Total and daily gains, three summers.*

Lot No.	Number of steers.	Days on feed.	Ration.	Average initial weight per steer.	Average final weight per steer.	Total average gain per steer.	Average daily gain per steer.
			1914.				
				Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1	25	126	Pasture and cottonseed cake	741	1,087	346	2.75
2	25	126	.....do	688	1,054	366	2.90
3	35	165	Pasture only	592	972	380	2.30
4	17	177	.....do	532	860	328	1.85
			1915.				
1–a	12	140	Pasture only	708	1,137	429	3.06
1–b	12	127	Pasture and cottonseed cake	742	1,086	344	2.71
2–a	12	140	Pasture only	705	1,073	368	2.63
2–b	12	127	Pasture and cottonseed cake	715	1,116	401	3.15
3	31	140	Pasture only	646	1,013	367	2.62
4	26	140	.....do	722	1,067	345	2.46
			1916.				
1–a	11	.....	Pasture only	772	1,099	327	2.34
1–b	12	.....	Pasture and cottonseed cake	789	1,136	347	2.48
2–a	12	.....	Pasture only	759	1,105	346	2.47
2–b	12	.....	Pasture and cottonseed cake	768	1,138	370	2.64
3	33	.....	Pasture	730	1,064	334	2.39
4	16	.....	.....do	788	1,104	316	2.26

Section 1 of Table 10, giving the results of the 1914 work, shows the initial weight of the cattle in Lot 1 to be 741 pounds, and the final weight after 126 days to be 1,087 pounds, making a total gain per steer of 346 pounds, or a daily gain of 2.75 pounds. The steers in Lot 2 made a total gain of 366 pounds, or an average daily gain of 2.90 pounds. The grass-finished cattle in Lot 3 made an average gain of 380 pounds, or an average daily gain of 2.30 pounds. The winter-grazed cattle (Lot 4), which were much lighter cattle, made a total gain of 328 pounds per steer, or an average daily gain of 1.85 pounds for a period of 177 days. It must be remembered that the cattle in Lots 1, 2, and 3 lost heavily during the previous winter and the unusual gains on these steers were due partly to getting back the flesh lost during the previous winter, and that those in Lot 4 gained in weight during the winter. As will be shown later, the total gain on the cattle in Lot 4 from fall to fall is larger than the gain on any of the other lots of steers. This is an interesting fact in connection with winter grazing and the possibility of adapting it to all mountainous counties of North Carolina and of adjoining States.

The second section, giving the results of the 1915 work, shows that Lot 1, division "a," contained 12 steers, which made a total gain of 429 pounds, or an average daily gain of 3.06 pounds. These cattle made an unusually large gain this year. The only way to account for

it was that the pasture probably was better than that provided for the others. Division "b" of Lot 1, the cake-finished cattle, in 127 days made a total gain of 344 pounds, or an average daily gain of 2.71 pounds. Lot 2, division "a," containing the grass steers, made a total gain of 368 pounds per steer, or an average daily gain of 2.63 pounds. Lot 2, division "b," containing the grass and cake fed steers, made a total gain per steer of 401 pounds, or an average daily gain of 3.15 pounds. Lot 3, containing the grass-fed steers, made a total gain of 367 pounds per steer, or an average daily gain of 2.62 pounds. Lot 4, containing the winter-grazed steers, made, on grass alone during the summer, a total gain of 345 pounds per steer, or an average daily gain of 2.46 pounds. These steers, as in previous

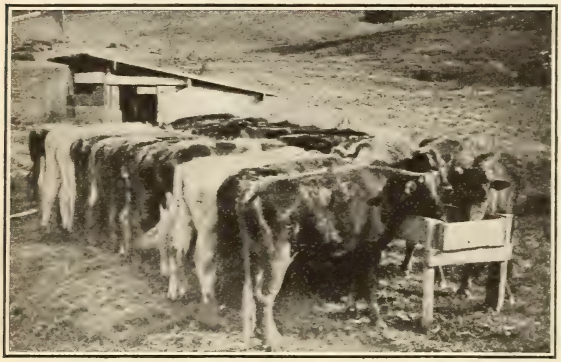

FIG. 5.—Cattle at beginning of summer fattening on pasture and cottonseed cake, 1914.

FIG. 6.—The same steers (shown in fig. 5) when finished in August, 1914.

years, made larger gains from fall to fall than any of the other cattle. However, all the steers in the four lots made good gains during the summer.

The third section gives the total and daily gains on the 1916 work. This was an unusually good year from the standpoint of the gains

made. The steers in Lot 1, division "a," made a total gain of 327 pounds per steer, or an average daily gain of 2.34 pounds during the 140 days they were on experiment. Lot 1, division "b," containing the grass and cake finished steers, made a total gain of 347 pounds, or an average daily gain of 2.48 pounds per steer in the same length of time. Lot 2, division "a," containing the grass-fed steers, made a total gain of 346 pounds, or an average daily gain of 2.47 pounds per steer. Lot 2, division "b," containing the grass and cake finished steers, made a total gain of 370 pounds, or an average daily gain of 2.64 pounds per steer. Lot 3, containing the grass cattle, made a total gain of 334 pounds, or an average daily gain of 2.39 pounds per steer. Lot 4, containing the winter-grazed cattle, made a total gain of 316 pounds, or 2.26 pounds daily per steer for the summer. As in the two previous years' trials, steers in

FIG. 7.—Condition of steers in spring before placing on pasture and cottonseed cake (Lot 1, 1916).

Lot 4 made the largest gain from fall to fall. The cake-fed steers made larger gains, however, than any of the steers that received pasture alone.

QUANTITY AND COST OF FEED REQUIRED TO MAKE 100 POUNDS GAIN.

The cost of 100 pounds of gain will vary in different sections owing to the difference in the cost of feed. When the farmer knows how many pounds of feed are required to make 100 pounds gain he can figure easily the cost under his own conditions. The principal thing stock raisers and farmers want to know is how many pounds of gain they can expect to put on a 2-year-old steer with grass alone or with grass supplemented with cottonseed cake and the cost to make 100 pounds of gain in each case.

Table 11 shows the quantity and cost of feed required to make 100 pounds of gain.

TABLE 11.—*Quantity and cost*[1] *of feed required for 100 pounds gain.*

Lot No.	Number of steers.	Days on feed.	Ration.	Pounds of feed to make 100 pounds of gain.	Cost of feed for 100 pounds of gain.
			1914.		
1	25	126	Pasture and cottonseed cake	126	$3.20
2	25	126	....do	120	3.03
3	35	165	Pasture only		1.55
4	17	177	....do		1.93
			1915.		
1-a	12	140	Pasture only		$1.16
1-b	12	127	Pasture and cottonseed cake	154	3.63
2-a	12	140	Pasture only		1.36
2-b	12	127	Pasture and cottonseed cake	132	3.11
3	31	140	Pasture only		1.36
4	26	140	....do		1.45
			1916.		
1-a	11	.....	Pasture only		$1.53
1-b	12	.....	Pasture and cottonseed cake	147	3.65
2-a	12	.....	Pasture only		1.45
2-b	12	.....	Pasture and cottonseed cake	142	3.48
3	33	.....	Pasture only		1.50
4	16	.....	....do		1.58

[1] Price of feed and pasture: Cottonseed cake, $30 per ton; pasture, $1 per head per 28-day period.

The first section of Table 11, giving the results of the 1914 work, shows it required 126 pounds of cottonseed cake in addition to the grass the steers in Lot 1 received to make 100 pounds gain, which cost $3.20 per hundredweight. The cattle in Lot 2 required 120 pounds cottonseed cake fed with grass to make 100 pounds gain at a cost of $3.03 per hundred pounds gain. The gains on the cattle in Lot 3, fed for a period of 165 days, cost $1.55 per 100 pounds, or just about one-half as much as where cottonseed cake was fed. The winter-grazed cattle (Lot 4), which were grazed during the summer for 177 days, made 100 pounds gain at a cost of $1.93. The gains were made much cheaper where no cottonseed cake was fed, there being very little difference in the cost of the gains in Lots 1 and 2, where cake was fed to both lots.

The second section gives the quantity and cost of feed required to make 100 pounds gain in the 1915 test. It cost $1.16 to put 100 pounds gain on the grass-finished cattle of Lot 1, division "a," these cattle making the cheapest gain of any of the grass-fed cattle. The cattle in Lot 1, division "b," made 100 pounds gain at a cost of $3.63, which were the most expensive gains made. The grass-finished cattle in Lot 2, division "a," made 100 pounds gain at a cost of

$1.36. The grass and cake finished cattle in Lot 2, division "b," made 100 pounds gain at a cost of $3.11. The grass-finished steers in Lot 3 made 100 pounds gain for the same cost as those in Lot 2, division "a," which was $1.36 per hundred pounds. The winter and summer grazed steers made 100 pounds gain at a cost of $1.45. This was a very cheap gain when it is considered that these steers were 17 pounds heavier in the spring than in the previous fall, whereas all the cattle in the other lots were from 28 to 32 pounds lighter in the spring than in the fall previous.

The third section gives the quantity and cost of feed required to make 100 pounds gain in the 1916 trial. The grass-finished cattle in Lot 1, division "a," made 100 pounds gain at a cost of $1.53. The grass and cake finished steers in Lot 1, division "b," made 100 pounds gain at a cost of $3.65, 147 pounds of cottonseed cake being fed with the grass to make this gain. The grass-finished steers in Lot 2, division "a," made 100 pounds gain at a cost of $1.45, which was the cheapest gain made by any of the cattle during this summer's work. The grass and cake finished steers in Lot 2, division "b," required somewhat less cake to make 100 pounds gain than those in Lot 1, division "b," only 142 pounds of cake being fed to make 100 pounds gain at a cost of $3.48. The grass-finished steers in Lot 3 made 100 pounds gain at a cost of $1.50. The winter and summer grazed steers (Lot 4) made 100 pounds gain during the summer at a cost of $1.58. This was a very cheap gain when it is considered that these cattle were 26 pounds heavier in the spring than in the fall previous, and that steers in the other lots had lost 30 to 40 pounds per head during the winter and would consequently make more rapid gains during the summer season.

SUMMARY OF THE THREE YEARS' WORK, INCLUDING WINTER AND SUMMER.

In order to make the combined winter and summer work for the three years clear, a general summary (Table 12) has been prepared, giving the rations, gain or loss for the winter per steer, gain for the summer per steer, total gain for the year, total cost per pound gain, total cost per steer, both winter and summer; and total profit per steer, including manure. In Lot 4, where the cattle were on pasture all winter, the manure was not included in figuring the profit per steer. The feeds in Table 12 were figured at the average cost for the three years.

TABLE 12.—*Summary of three years' work, winter and summer.*

Lot No.	Ration.	Year.	Gain (+) or loss (−) for winter per steer.	Gain for summer per steer.	Total gain over fall weight per steer.	Cost per pound of yearly gain.	Total cost per steer.	Total profit per steer, including manure.
			Pounds.	*Pounds.*	*Pounds.*			
1-a	Winter: Ear corn, stover, and hay. Summer: Grass.	1913–14	[1]					
		1914–15	−32	429	397	$0.043	$17.20	$20.62
		1915–16	−35	327	292	.055	16.08	16.84
	Average		−33	378	344	.048	16.64	18.73
1-b	Winter: Ear corn, stover, and hay. Summer: Grass and cake.	1913–14	−28	346	318	.066	21.16	22.75
		1914–15	−32	344	312	.079	24.70	14.36
		1915–16	−35	347	312	.096	30.13	12.45
	Average		−32	345	314	.074	25.33	19.85
2-a	Winter: Silage, stover, and hay. Summer: Grass.	1913–14	[1]					
		1914–15	−28	368	340	.037	12.58	20.30
		1915–16	−42	346	302	.039	11.78	21.83
	Average		−35	357	321	.038	12.18	21.06
2-b	Winter: Silage, stover, and hay. Summer: Grass and cake.	1913–14	−82	366	284	.064	18.07	23.23
		1914–15	−28	401	373	.054	20.07	24.10
		1915–16	−42	370	328	.078	25.83	16.31
	Average		−51	379	328	.065	21.32	21.54
3	Winter: Silage, stover, and hay. Summer: Grass.	1913–14	−84	380	296	.040	11.94	24.31
		1914–15	−32	367	335	.037	12.45	19.87
		1915–16	−40	334	294	.040	11.78	21.12
	Average		−52	360	308	.039	12.06	21.77
4	Winter: Pasture. Summer: Pasture	1913–14	17	328	345	.032	10.98	[2] 21.75
		1914–15	17	345	362	.031	11.29	[2] 21.18
		1915–16	26	316	342	.030	10.23	[2] 24.16
	Average		20	330	350	.031	10.80	[2] 22.36

[1] All the steers in Lots 1 and 2 during 1914 were fed cottonseed cake and pasture.
[2] No manure included.

Table 12 shows that the steers in Lot 1, division "a," were wintered each year on ear corn, corn stover, and hay. During the summer they were on grass alone. These steers lost an average of 33 pounds per steer each winter for the three years. During the summer they made an average total gain of 378 pounds, or a total gain over the initial fall weight of 344 pounds, at an average total cost of $16.64 per steer. They made an average profit per steer of $18.73, the total average cost per pound of gain being $0.048.

The steers in Lot 1, division "b," wintered the same as those in Lot 1, division "a," but fed cottonseed cake on grass during the summer, lost 32 pounds per steer during the winter. The average total gain during the summer was 345 pounds, or a total gain per steer over the initial fall weight of 314 pounds. The total cost per steer was $25.33, showing an average profit per steer of $19.85, the total average cost per pound of gain being $0.074.

The steers in Lot 2, division "a," wintered on corn silage, corn stover, hay, and straw, and getting grass alone during the summers, lost on an average 35 pounds per steer during the winter. The aver-

age gain for the summer was 357 pounds per steer, the average total gain over initial weight of 321 pounds, the average total cost per steer $12.18, showing an average profit of $21.06 per steer, the total average cost per pound gain being $0.038.

The steers in Lot 2, division "b," were wintered the same as those in Lot 2, division "a," and were given cake in addition to grass during the summers. These steers lost an average during the winter of 51 pounds per head. They made an average gain for the summer of 379 pounds, or a total gain over initial weight of 328 pounds. The average total cost was $21.32 per steer, showing an average profit of $21.54 per steer, the total cost per pound of gain being $0.065.

The steers in Lot 3 were wintered the same as those in Lot 2, on corn silage, corn stover, hay, and straw, and summered on grass without cake. These cattle lost an average of 52 pounds per head during the winter, and made an average total gain during summers of 360 pounds, or a total gain over initial fall weight of 308 pounds at an average total cost of $12.06, showing an average profit of $21.77. The total cost per pound of gain was $0.039.

The cattle in Lot 4 were grazed both winter and summer. It is very interesting to study the results of this work, as these cattle gained an average of 20 pounds per steer during each winter for the three years. The total gain for the summer averaged 330 pounds per steer, or a total gain over the initial fall weight of 350 pounds at an average total cost of $10.80, showing an average profit of $22.36 per steer, exclusive of the value of the manure. The total cost per pound gain was $0.031.

CONCLUSIONS.

During the first two summers' work the feeding of cottonseed cake to steers on grass was profitable. During the last year's work, owing to the high price of the cake, it did not pay. Considering this fact and the high price that feeders have been selling for, the feeding of cottonseed cake on grass will not prove sufficiently profitable to recommend it as a general practice. It should be understood, however, that this applies to conditions similar to those where this work was conducted, that is, where the steers can get an abundance of excellent blue grass.

Winter grazing not only proved to be the most satisfactory method of wintering stock cattle, producing a substantial gain each year, but it was the cheapest method tried in any of the wintering work. In addition to this, these winter-grazed cattle made the largest total gain for the year and at less cost per head than any of the steers wintered in the barns.

These winter-grazed cattle also made a larger average profit than any of the other lots of cattle. Not including the manure, the total

profit was $22.36 per head. Allowing a credit of $4 per steer for the manure during the winter, the profit was $26.36 per head. This proved to be one of the most favorable and satisfactory methods of handling cattle during both winter and summer.

The winter-grazed cattle cost the least per head, both winter and summer, this being $10.80, or $1.26 less per head than the steers in Lot 3, which made the next most economical showing and whose total profit was $21.77 per head.

The results of three years' work show that steers which have been fed silage heavily during the winter, make practically as good gains the following summer on pasture as steers wintered solely on dry feeds. The total average gain of the silage-wintered steers from fall to fall was 319 pounds, while the dry-fed steers made a total average gain of 329 pounds per head. Considering that the dry-fed cattle were somewhat the better in quality, there is not enough difference in the gains to show that silage-wintered cattle do not thrive well the following summer.

The results show conclusively the value of winter pasture when combined with summer pasture. The total average gain from fall to fall on these cattle was 350 pounds, which was made at a cost of $0.031 per pound. The winter-grazed cattle did well on summer grass and on the average were better cattle when finished in the fall than those wintered in the barns.

The next most economical showing was made by the cattle wintered on silage, stover, and hay, followed by grass in summer. The average cost per pound gain was $0.039 for the total gain made from fall to fall. This shows the value of silage in wintering stocker cattle.

The dry-wintered cattle which were finished on grass alone the next summer made an average gain of 344 pounds per steer at an average cost of $0.048 per pound, which was practically 1 cent per pound more for the total gains made than the silage-wintered cattle.

The cattle wintered on silage, corn stover, and hay and finished on grass and cake made an average total gain from fall to fall of 328 pounds at a cost of $0.065 per pound, whereas the cattle wintered on the same ration but finished on grass alone made their gains at a cost of $0.038 per pound. This shows that the silage and grass combination during winter and summer, respectively, is the more satisfactory, considering the cost of the gains.

The steers wintered on a dry ration of ear corn, corn stover, and hay and finished during the summer on grass and cottonseed cake made a total gain of 314 pounds from fall to fall at an average cost of $0.074 per pound. This was the most expensive gain produced. It is interesting to note in this connection that this is the common

method of wintering stock cattle in the mountains of North Carolina and of surrounding States.

Considering the combination where the cattle were dry-wintered on ear corn, corn stover, and hay and finished on grass alone, the average cost per pound for the total gain made from fall to fall was $0.048. The difference between the ration fed in this case and that presented in the foregoing paragraph was the elimination of the cottonseed cake during the summer, which reduced the cost per pound of gain from $0.074 to $0.048. These figures show that the combination of dry wintering with grass during the summer produced the least economical gains from fall to fall. The important conclusion to be drawn from these figures is that, where winter pasture can not be provided, cattle wintered on corn silage with dry roughage and finished on grass make the cheapest gains.

FINANCIAL STATEMENTS.

In connection with the following yearly financial statements it should be remembered that the figures apply to the local conditions where the work was conducted. There are a great many factors which will make financial statements vary, such as the initial cost and selling price of the steers, cost of the various feeds, and cost of pasture. The statements presented below show that all the cattle made a profit, the great value of winter pasture being especially prominent in this connection.

TABLE 13.—*Financial statement, 1913-14.*

Lot 1. Wintered 128 days on ear corn, corn stover, and hay. Finished on pasture and cottonseed cake 126 days:	
To 25 steers, 19,235 pounds, at $5.50 per cwt	$1,057.92
To wintering 25 steers, at $8.80 per cwt	220.00
To pasture 126 days, at $1 per 28 days	112.50
To 10,932 pounds cottonseed cake, at $30	163.98
Total expenditures	1,554.40
By sale of 25 steers,[1] 27,170 pounds, at $7.75	2,105.67
By value of 25 tons manure, at $2 per ton	50.00
Total receipts	2,155.67
Total profit, including manure	601.27
Total profit, not including manure	551.27
Average profit per steer, including manure	24.05
Average profit per steer, not including manure	22.05

[1] This lot was sold in Asheville, N. C., at home weights. No slaughter or shrinkage data secured.

Lot 2. Wintered 128 days on corn silage, corn stover, and hay. Fattened on pasture and cottonseed cake 126 days:	
To 25 steers, 19,250 pounds, at $5.50 per cwt.	$1,058.75
To wintering 25 steers, at $6.96 per cwt	174.00
To pasture of 25 steers, 126 days, at $1 per 28 days	112.50
To 11,004 pounds cottonseed cake, at $30 per ton	165.06
Total expenditures	1,510.31
By sale of 25 steers,[1] 26,340 pounds, at $7.75	2,041.35
By value of 25 tons manure, at $2 per ton	50.00
Total receipts	2,091.35
Total profit, including manure	581.04
Total profit, not including manure	531.04
Average profit per head, including manure	23.24
Average profit per head, not including manure	21.24
Lot 3. Wintered 123 days on corn silage, corn stover, and hay. Finished on pasture alone, 165 days:	
To 35 steers, 23,665 pounds at $5 per cwt	1,183.25
To wintering 35 steers at $6.05 per cwt	211.75
To pasture, 165 days at $1 per 28 days	206.25
Total expenditures	1,601.25
By sale of 35 steers,[2] 34,030 pounds at $7	2,382.10
By value of 35 tons manure at $2 per ton	70.00
Total receipts	2,452.10
Total profit including manure	850.85
Total profit not including manure	780.85
Average profit per head including manure	24.31
Average profit per head not including manure	22.31
Lot 4. Wintered on range 112 days. Finished on pasture only, 177 days:	
To 17 steers, 8,765 pounds at $4.50 per cwt	394.42
To wintering 17 steers at $4.66 per head	79.22
To summer pasture, 177 days at $1 per 28 days	107.44
Total expenditures	581.08
By sale of 17 steers,[2] 14,630 pounds at $6.50	950.95
Total receipts	950.95
Total profit, 17 steers	369.87
Average profit per head	21.75
Prices charged for feeds in 1913–14:	
Ear corn, per bushel	.50
Cottonseed cake, per ton	30.00
Corn silage, do	3.00
Corn stover and hay, do	10.00
Hay (alone), do	15.00

[1] This lot was sold in Asheville at home weights. No shrinkage or slaughter data secured.

[2] This lot sold as feeders.

TABLE 14.—*Financial statement, 1914–15.*

Lot 1–a. Wintered on ear corn, stover, and hay; finished on pasture:	
To 12 steers, 8,750 pounds, at $6 per cwt	$525.00
To wintering 12 steers, 131 days, at $12.75 each	153.00
To pasture charges, 140 days, at $1 per 28 days	60.00
Total expenditures	738.00
By sale of 12 steers, 13,640 pounds, at $7	954.80
By value of 12 tons manure, at $2 per ton	24.00
Total receipts	978.80
Total profit, including manure	240.80
Total profit, not including manure	216.80
Average profit per head, including manure	20.06
Average profit per head, not including manure	18.06
Lot 1–b. Wintered on ear corn, corn stover, and hay. Summer fattened on grass and cottonseed cake:	
To 12 steers, 9,420 pounds, at $6 per cwt	565.20
To wintering 12 steers, 131 days, at $12.75 each	153.00
To pasture charges, 127 days, at $1 per 28 days	54.48
To 6,360 pounds cottonseed cake, at $25 per ton	79.50
Total expenditures	852.18
By sale of 12 steers, 13,030 pounds, at $7.75	1,009.82
By value of 12 tons of manure, at $2 per ton	24.00
Total receipts	1,033.82
Total profit, including manure	181.64
Total profit, not including manure	157.64
Average profit per head, including manure	15.13
Average profit per head, not including manure	13.13
Lot 2–a. Wintered on corn silage, stover, and hay. Fattened on pasture alone:	
To 12 steers, 8,850 pounds, at $6 per cwt	$531.00
To wintering 12 steers, 131 days, at $7.58 each	90.96
To pasture, 140 days, at $1 per 28 days	60.00
Total expenditures	681.96
By sale of 12 steers, 12,880 pounds, at $7	901.60
By value of 12 tons of manure, at $2 per ton	24.00
Total receipts	925.60
Total profit, including manure	243.64
Total profit, not including manure	219.64
Average profit per head, including manure	20.30
Average profit per head, not including manure	18.30

Lot 2–b. Wintered on silage, stover, and hay. Finished on pasture and cottonseed cake:	
To 12 steers, 8,860 pounds, at $6 per cwt	$531.60
To wintering 12 steers, 131 days, at $7.58 each	90.96
To pasture for 12 steers, 127 days, at $1 per 28 days	54.48
To 6,360 pounds cottonseed cake, at $25 per ton	79.50
Total expenditures	756.54
By sale of 12 steers, 13,390 pounds, at $7.75	1,037.72
By value of 12 tons manure, at $2 per ton	24.00
Total receipts	1,061.72
Total profit, including manure	305.18
Total profit, not including manure	281.18
Average profit per head, including manure	25.43
Average profit per head, not including manure	23.43
Lot 3. Wintered on silage, stover, and hay. Finished on pasture alone:	
To 31 steers, 21,000 pounds at $6 per cwt	1,260.00
To wintering, 131 days at $7.45 each	230.95
To pasture, 140 days at $1 per 28 days	155.00
Total expenditures	1,645.95
By sale of 31 steers, 31,430 pounds at $7 per cwt	2,200.10
By value of 31 tons manure, at $2 per ton	62.00
Total receipts	2,262.10
Total profit, including manure	616.15
Total profit, not including manure	554.15
Average profit per head, including manure	19.87
Average profit per head, not including manure	17.87
Lot 4. Winter grazed. Finished on pasture alone:	
To 26 steers, 18,330 pounds at $6 per cwt	1,099.80
To wintering 26 steers 131 days at $6.41 each	166.66
To pasture, 140 days, at $1 per head for 28 days	130.00
Total expenditures	1,396.46
By sale of 26 steers, 27,760 pounds at $7 per cwt	1,943.20
Total receipts	1,943.20
Total profit on 26 steers	546.74
Average profit per steer	21.03
Prices of feeds charged in 1914–15:	
Ear corn—per bushel	1.00
Cottonseed cake—per ton	25.00
Corn stover, hay, and straw—do	10.00

TABLE 15.—*Financial statement, 1915–16.*

Lot 1–a. Wintered on ear corn, stover, hay, and straw. Finished on pasture:	
To 11 steers,[1] 8,940 pounds at $6 per cwt	$536.40
To wintering 11 steers, 119 days at $12.13 each	133.43
To pasture, 140 days at $1 per 28 days	55.00
Total expenditures	724.83
By sale of 11 steers, 12,090 pounds at $7.25	876.52
By value of 11 tons manure at $2	22.00
Total receipts	898.52
Total profit including manure	173.69
Total profit not including manure	151.69
Average profit per head including manure	15.79
Average profit per head not including manure	13.79
Lot 1–b. Wintered on ear corn, stover, hay, and straw. Finished on pasture and cottonseed cake:	
To 12 steers, 9,730 pounds at $6 per cwt	583.80
To wintering 12 steers, 119 days at $12.13 each	145.56
To pasture, 140 days at $1 per 28 days	60.00
To cottonseed cake, 6,540 pounds at $35 per ton	114.45
Freight, Clyde to Baltimore	46.68
Feed in transit to Spencer, N. C	1.75
Feed and insurance in yards at Baltimore	12.05
Commission charges	10.00
Total expenditures	974.29
By sale of 12 steers, 13,100 pounds at $8.25	1,070.75
By value of 12 tons manure at $2	24.00
Total receipts	1,094.75
Total profit including manure	120.46
Total profit not including manure	96.46
Average profit per steer including manure	10.03
Average profit per steer not including manure	8.03
Lot 2–a. Wintered on corn silage, corn stover, hay and straw. Finished on grass:	
To 12 steers, 9,700 pounds at $6 per cwt	582.00
To wintering 12 steers, 119 days at $6.78 each	81.36
To pasture, 140 days at $1 per 28 days	60.00
Total expenditures	723.36
By sale of 12 steers, 13,260 pounds at $7.25 per cwt	961.31
By value of 12 tons manure at $2 per ton	24.00
Total receipts	985.31

[1] This lot was started with 12 steers, but one of them died, so only 11 were used.

Lot 2-a—Continued.	
Total profit including manure	$261.95
Total profit not including manure	237.95
Average profit per head including manure	21.83
Average profit per head not including manure	19.83
Lot 2-b. Wintered on corn silage, corn stover, hay, and straw. Finished on grass and cottonseed cake:	
To 12 steers, 9,640 pounds at $6 per cwt	578.40
To wintering 12 steers, 119 days at $6.78 each	81.36
To pasture, 140 days at $1 per 28 days	60.00
To cottonseed cake, 6,540 pounds at $35 per ton	114.45
Freight, Clyde to Baltimore	46.68
Feed in transit to Spencer, N. C	1.75
Feed and insurance in yards, Baltimore	12.05
Commission charges	10.00
Total expenditures	904.69
By sale of 12 steers, 12,850 pounds at $8.25	1,060.12
By value of 12 tons of manure at $2	24.00
Total receipts	1,084.12
Total profit including manure	179.43
Total profit not including manure	155.43
Average profit per head including manure	14.95
Average profit per head not including manure	12.95
Lot 3. Wintered on corn silage, stover, hay, and straw. Finished on pasture:	
To 33 steers, 25,415 pounds at $6 per cwt	1,524.90
To wintering 33 steers, 119 days at $6.78 each	223.74
To pasture, 140 days at $1 per 28 days	165.00
Total expenditures	1,913.64
By sale 33 steers, 35,100 pounds at $7.25	2,544.75
By value of 33 tons of manure at $2 per ton	66.00
Total receipts	2,610.75
Total profit, including manure	697.11
Total profit, not including manure	631.11
Average profit per steer, including manure	21.12
Average profit per steer, not including manure	19.12
Lot 4. Winter grazed and summer grazed:	
To 16 steers, 12,195 pounds at $6 per cwt	730.80
To winter pasture, 119 days at $1 per 28 days	68.00
To feed during snows at $1.05 per head	16.80
To summer pasture, 140 days at $1 per 28 days	80.00
Total expenditures	895.60
By sale of 16 steers, 17,670 pounds at $7.25 per cwt	1,281.07
Total receipts	1,281.07

Lot 4—Continued.

Total profit on 16 steers	$385.47
Average profit per steer	24.09
Prices of feeds charged in 1915–16:	
Ear corn, per bushel	1.00
Cottonseed cake, per ton	35.00
Corn silage, do	3.00
Hay, stover, and straw, do	10.00

SLAUGHTER DATA.

At the close of the first year's work the cake-fed steers in Lots 1 and 2 were sold to local butchers in Asheville. They were killed at different times, so the slaughter data were not obtainable. The same applies to these lots in the second year's work, 1914–15. They were sold to a prominent North Carolina resort owner, who continued to feed them during the winter to supply the hotels, a few being killed at a time.

The cake-fed steers in Lots 1 and 2 in 1916 were shipped direct to market and the shipping and slaughter data are given in Table 16.

TABLE 16.—*Shipping and slaughter data, 1915–16.*

Item.	Lot 1–b.	Lot 2–b.
Number of steers	12	12
Final weight on farm Sept. 5, pounds	1,149	1,158
Weight at railroad station Sept. 5, do	1,108	1,099
Shrinkage in driving to railroad, do	41	59
Do, per cent	3.57	5.1
Selling weight, pounds	1,092	1,071
Total net shrinkage in transit, do	57	87
Do, per cent	4.96	7.51
Dressing percentage on farm weight, do	52.24	52.59
Dressing percentage on market weight, do	54.99	56.97

These cattle were driven 15 miles to the railroad station, where they were watered and then loaded on cars. They were shipped September 5. They arrived in Baltimore September 8 and were sold on the market September 11. All the cattle summered on grass were sold as feeders, so that only a very small number of slaughter data were obtained from the summer work.

Table 16 shows that the steers in Lot 1–b, wintered on dry feed, lost 57 pounds in transit, and the steers in Lot 2–b, wintered on corn silage, lost 87 pounds in transit. This difference is accounted for by the fact that the winter dry-fed cattle took a greater fill of water than those in Lot 2. The steers in Lot 1 had been accustomed to drinking out of water troughs at the farm, and when they reached Baltimore they took more water than Lot 2, which had drunk out of the branch both winter and summer. Although the silage-fed cattle lost more in transit, it will be noticed that their dressing percentage was higher on both market and home weights than that of the steers in Lot 1.

IV. WINTER FATTENING OF STEERS.

In the mountain districts of western North Carolina and adjacent sections of other States it has been the custom for farmers and stockmen to sell their steers in the fall of the year as feeders. When it is taken into consideration that some of these farmers raise considerable feed, such as corn, hay, and straw, which is often not used most advantageously, and that the cattle handled under the usual methods furnish little manure for the cultivated fields, the feasibility of profitably finishing out a large number of these steers for the block is a question that at once presents itself. Many farmers of this section have desired information concerning the values of home-grown feeds, especially silage and other roughages, as well as the use of cottonseed meal and cottonseed hulls for fattening steers.

The following-described experiments were carried out to furnish dependable information of this sort and to illustrate methods of feeding and handling steers on feed in the dry lot, besides affording a comparison between selling steers as finished beeves and as feeders.

EXPERIMENTS OF 1913–14.

These experiments were conducted for the purpose of determining whether steers in this region could be fattened profitably during winter months for the market, and of comparing this method of disposing of the steers with the usual practice of selling them as feeders in the fall. It was desired also to obtain information as to what feeds usually would prove most efficient and profitable in finishing mature steers under farm conditions in these mountain regions.

These objects involve a consideration of the methods best adapted for handling the steers, the use of native feeds ordinarily available, as well as the use of cottonseed meal and cottonseed hulls, which must be shipped in, and a study of the problems connected with marketing the finished cattle.

PLAN OF THE WORK.

The work was carried out under average farm conditions for the section, and the care and attention given it were such as any good farmer should employ in doing similar work for himself. The cattle were divided into two lots of 12 steers each and were given the same care and management. The steers in Lot 1 were fed a ration of cottonseed meal, cottonseed hulls, and a mixture of corn stover and hay, while those of Lot 2 were fed cottonseed meal, ear corn, and cottonseed hulls, with corn stover and hay. The steers were fed from November 17, 1913, to March 9, 1914, a total of 113 days.

KIND OF STEERS USED.

All the steers were representative native cattle of western North Carolina, averaging 2 years old, and had been secured from Haywood, Madison, and Buncombe Counties. None of them was a pure bred. Most of them were Shorthorn, Hereford, and Angus grades; some were grade Devons; and a few showed traces of dairy breeding. They were uniform in size and were divided into two lots as equally as possible according to weight, quality, and condition.

CHARACTER AND PRICES OF FEEDS USED.

All the feeds used were valued at standard market prices. The cottonseed meal was of good quality, analyzing about 38.6 per cent crude protein, and cost $30 per ton delivered at the farm. The cottonseed hulls were bought and delivered in car lots for $7.50 per ton and were a good grade of loose hulls.

The ear corn used was not of good quality, as it had been frosted before maturing and was soft. Its market value was very low, but it was charged against the steers at 50 cents per bushel of 70 pounds.

The corn stover was of average grade and had been frosted before it was cut. It was valued at $5 per ton.

The hay used was good bright hay made from a mixture of timothy, herd's grass, clover, and orchard grass, and was valued at $15 per ton. The hay and corn stover were mixed in equal quantities and run through a feed cutter before being fed. This mixture was charged against the cattle at $10 per ton.

METHOD OF FEEDING AND HANDLING.

During the fattening period the steers were kept in barns, and for about 30 minutes twice each day were allowed to run in open lots, where they had access to water. They were fed at 8 o'clock in the morning and at 5 o'clock in the afternoon. The cottonseed meal and cottonseed hulls were mixed thoroughly in the troughs before the steers were turned to the feed. The ear corn was mixed with the hulls and meal. The mixture of corn stover and hay was fed after the meal and hulls had been eaten and after the steers had taken their fill of water. Comparatively small quantities of cottonseed meal and corn were fed to the steers at the start of the test, so as not to get any of them "off feed."

The cattle were weighed every 28 days, early in the morning before feed or water was given. The initial and final weights were averaged from the weights obtained for three consecutive days.

AMOUNTS OF FEED CONSUMED AND AVERAGE DAILY RATIONS.

Table 17 shows the total amount of feed eaten by each steer and the average daily ration per head by periods and for the total period.

TABLE 17.—*Feeds consumed and average daily rations, Nov. 17, 1913, to Mar. 9, 1914, 113 days.*

Lot No.	Number of steers.	Days fed.	Ration.	Total feed consumed per steer.	Average daily rating by periods.				Average daily ration for entire period.
					First period, 29 days.	Second period, 28 days.	Third period, 28 days.	Fourth period, 28 days.	
				Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1	12	113	Cottonseed meal	744	4.02	6.96	7.50	7.95	6.85
			Cottonseed hulls	1,881	16.04	17.00	16.57	17.00	16.65
			Corn stover and hay	458	5.00	3.33	3.33	4.52	4.05
2	12	113	Cottonseed meal	535	3.25	4.91	5.00	5.84	4.73
			Ear corn	710	4.32	6.87	7.00	7.00	6.28
			Cottonseed hulls	1,828	16.04	16.61	15.61	16.46	16.17
			Corn stover and hay	338	4.77	2.62	2.06	2.47	2.99

During the first period of 29 days each steer in Lot 1 ate an average of 4.02 pounds of cottonseed meal, 16.04 pounds of hulls, and 5 pounds of corn stover and hay. The allowance of cottonseed meal was gradually increased until the last period, when they consumed 7.95 pounds of cottonseed meal per head daily. The roughage was supplied in such quantities as the cattle would eat, and it can be seen from the table that there was little variation from month to month. The average daily ration per head for the entire period of 113 days was 6.85 pounds cottonseed meal, 16.65 pounds of hulls, and 4.05 pounds of stover and hay.

Each steer in Lot 2 during the first 29 days ate an average daily ration of 3.25 pounds of cottonseed meal, 4.32 pounds of ear corn, 16.04 pounds of cottonseed hulls, and 4.77 pounds of hay and stover. The cottonseed meal and corn were gradually increased and the roughages slightly decreased, until during the last period each steer ate an average daily ration of 5.84 pounds of cottonseed meal, 7 pounds of ear corn, 16.46 pounds of hulls, and 2.47 pounds of hay and corn stover. The average daily ration per head for the 113 days the steers were on feed was 4.73 pounds of cottonseed meal, 6.28 pounds of ear corn, 16.17 pounds of cottonseed hulls, and 2.99 pounds of hay and stover.

It will be noted that heavy rations of roughages were fed, but that when the concentrate allowances were increased the steers would not eat as much of the hay and stover. Each lot consumed practically the same amount of cottonseed hulls, but Lot 2 used less of the hay and stover. It would appear that Lot 2 had a much heavier allowance of concentrates, but it will be recalled that the corn was light and soft and was fed in the ear.

TOTAL AND DAILY GAINS.

Table 18 shows the average initial and final weights per head for the steers in each lot, and the total and daily gains made by each steer.

TABLE 18.—*Total and daily gains, Nov. 17, 1913, to Mar. 9, 1914, 113 days.*

Lot No.	Number of steers.	Ration.	Average initial weight per steer.	Average final weight per steer.	Average total gains per steer.	Average daily gains per steer.
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1	12	Cottonseed meal, cottonseed hulls, corn stover, and hay	819	973	154	1.36
2	12	Cottonseed meal, ear corn, cottonseed hulls, corn stover, and hay	823	983	160	1.42

The steers in Lot 1 made an average total gain of 154 pounds per head during the 113 days of the fattening period, while those of Lot 2 averaged 160 pounds. The average daily gains per head were 1.36 pounds for Lot 1 and 1.42 pounds for Lot 2. Considering that the steers were in good condition when the feeding began, and noting the rations fed, it can be seen that these gains, though not large, were very satisfactory. The lot of steers fed cottonseed meal and ear corn made slightly larger gains.

QUANTITY AND COST OF FEED REQUIRED FOR 100 POUNDS GAINED.

The quantity and cost of feeds required to produce 100 pounds of gain for each lot is shown in Table 19.

TABLE 19.—*Quantity and cost*[1] *of feed required to make 100 pounds of gain.*

Lot No.	Number of steers.	Ration.	Pounds of feed required to make 100 pounds of gain.	Cost of feed for 100 pounds of gain.
1	12	Cottonseed meal	483	$13.32
		Cottonseed hulls	1,222	
		Corn stover and hay	297	
2	12	Cottonseed meal	334	13.92
		Ear corn	443	
		Cottonseed hulls	1,247	
		Corn stover and hay	211	

[1] Prices of feeds used:

Cottonseed meal	$30.00 per ton.
Cottonseed hulls	7.50 per ton.
Ear corn	.50 per bushel.
Corn stover and hay mixed	10.00 per ton.

It required 483 pounds of cottonseed meal, 1,222 pounds of cottonseed hulls, and 297 pounds of hay and corn stover, valued at $13.32, to produce 100 pounds of gain for the steers in Lot 1, and for those in Lot 2, 334 pounds of cottonseed meal, 443 pounds of ear corn, 1,247

pounds of cottonseed hulls, and 211 pounds of hay and stover, valued at $13.92. Thus it is seen that considerably more concentrates were required to produce 100 pounds of gain in Lot 2, while the amount of roughage, including the cobs in the ear corn fed to Lot 2, was nearly the same for both lots. Apparently this would indicate clearly that corn was not efficient in producing gains; but it should be remembered that the corn was of poor quality.

Although the steers in Lot 2 gained more, the gains cost 60 cents per hundredweight more than in Lot 1.

The amount and cost of feed required to make 100 pounds of gain are factors of great interest to the feeder. As the prices of feeds fluctuate from year to year, the farmer, knowing the quantity and cost of feed needed to produce 100 pounds of gain, can calculate safely what gains he may expect from certain rations, and determine the approximate cost of putting the gains on his cattle under the different conditions.

Table 20 shows the average final farm and market weights per head, the shrinkage in transit to market, the carcass weights, and dressing percentages of the steers.

TABLE 20.—*Slaughter data, winter fattening of 1913–14.*

Lot No.	Ration.	Average farm weight per steer, Mar. 10.	Average market weight per steer, Mar. 16.	Average shrinkage per steer in transit.	Average weight of carcass.	Percentage of shrinkage.	Percentage dressed by farm weights.	Percentage dressed by market weights.
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*
1	Cottonseed meal, cottonseed hulls, corn stover, and hay	973	892	81	485	8.35	49.9	54.4
2	Cottonseed meal, ear corn, cottonseed hulls, corn stover, and hay	983	898	85	513	8.66	52.2	57.2

In transit the steers in Lot 1 sustained a shrinkage of 81 pounds per head, while those of Lot 2 lost 85 pounds per head, so there was little difference in the shrinkage of the two lots. This excessive shrinkage is accounted for by the fact that the cattle left the farm at Springdale on March 10, 1914, were driven 10 miles over bad roads to a loading point, loaded the following morning, and shipped to Baltimore, where they arrived after a three days' trip. In addition to these disadvantages when the steers arrived at the market the weather was very cold and disagreeable, which prevented their taking a normal fill of water.

It will be noted that the carcasses of the steers of Lot 2 weighed heavier than those of Lot 1, and also dressed out better. Those in Lot 1 dressed out 54.4 per cent and those of Lot 2, 57.2 per cent by market weights. This difference in the killing conditions of the steers was detected very easily in the carcasses, as those of Lot 2

carried a greater quantity of fat, which was well distributed. The butchers estimated the steers of Lot 2 should have sold for 10 cents per hundredweight more than those of Lot 1, although it is shown in the financial statement that all the cattle brought the same price per hundredweight.

The superior finish which the steers of Lot 2 had taken on must be considered as a point in favor of the ration which they were fed. Even though it cost 60 cents more to put on 100 pounds of gain on the cattle of Lot 2, a difference of only 10 cents per hundredweight in the selling price of the steers would offset to a large extent this difference. The degree of finish, then, must be considered in planning rations for cattle, because the highly finished steers bring better prices.

Table 21 gives the financial statement of the two lots of steers. This is given merely to throw light on the financial outcome of a typical feeding operation during the season of 1913–14. The financial statement for a similar group of steers fed the same rations might be entirely different for any other year, as there are so many factors which affect it. Among these may be mentioned the initial cost of the steers, cost of various feeds, cost of gains, distance from market, and the market prices. All these factors vary a great deal in different years or even during the same year.

The manure which fattening steers produce is an important item in the business of feeding and by all means should be credited to the steers. In this work the manure was weighed and valued at $2 per ton, which is a very conservative valuation. The value of the fertilizing constituents in a ton of this manure undoubtedly would cost much more than $2 if they were purchased in the form of commercial fertilizers.

TABLE 21.—*Financial statement, winter fattening, November 17, 1913, to March 9, 1914, 113 days.*

Lot 1. Cottonseed meal, cottonseed hulls, corn stover, and hay:	
To 12 steers, 9,830 pounds at $5.50 per cwt	$540.65
To 8,930 pounds cottonseed meal at $30 per ton	133.95
To 22,575 pounds cottonseed hulls at $7.50 per ton	84.66
To 5,498 pounds corn stover and hay at $10 per ton	27.49
Total cost of feed	246.10
Cost of marketing	46.50
Total expenditures	833.25
By sale of 12 steers, 10,700 pounds at $7.60 per cwt	813.20
By value of 48 tons manure at $2 per ton	96.00
Total receipts	909.20

Lot 1—Continued.	
Total profit including manure	$75.95
Total loss not including manure	20.05
Average profit per steer including manure	6.33
Average loss per steer not including manure	1.67
Lot 2. Cottonseed meal, ear corn, cottonseed hulls, corn stover, and hay:	
To 12 steers, 9,880 pounds at $5.50 per cwt	543.40
To 6,422 pounds cottonseed meal at $30 per ton	96.33
To 8,516 pounds ear corn at 50 cents per bushel	60.82
To 21,938 pounds cottonseed hulls at $7.50 per ton	82.27
To 4,060 pounds corn stover and hay at $10 per ton	20.30
Total cost of feed	259.72
To cost of marketing	46.50
Total expenditures	849.62
By sale of 12 steers, 10,775 pounds at $7.60 per cwt	818.90
By value of 48 tons manure at $2 per ton	96.00
Total receipts	914.90
Total profit including manure	65.28
Total loss not including manure	30.72
Average profit per steer including manure	5.44
Average loss per steer not including manure	2.56

NOTE.—Steers of Lot 1 valued at market at $7.55 per cwt.; steers of Lot 2 valued at market at $7.65 per cwt.; all were sold in one lot at $7.60 per cwt.

Comparing the financial statements of the two lots, it is seen that when the value of the manure is credited to the feeding, Lot 1 returned a profit of $75.95, or an average profit per steer of $6.33; while Lot 2 returned a profit of $65.28, or an average profit of $5.44 per steer. If no credit is allowed for manure produced, both lots were sold at a loss. Thus, notwithstanding the fact that the steers of Lot 1 made smaller gains, the gains were produced more economically.

EXPERIMENTS OF 1914–15.

The experiments conducted during the winter of 1914–15 were carried out with the same objects in view as the previous winter's fattening tests.

PLAN OF WORK.

The same general plans followed in the previous winter were adhered to. Four lots of steers were fed as follows:

Lot 1, 10 steers, fed cottonseed meal, cottonseed hulls, and ear corn.
Lot 2, 100 steers, fed cottonseed meal and cottonseed hulls.
Lot 3, 21 steers, fed cottonseed meal and corn silage.
Lot 4, 26 steers, fed cottonseed meal and cottonseed hulls.

The steers in the first three lots were fed for 96 days, and those in Lot 4 for 111 days.

KIND OF STEERS USED.

The steers used in the experiments of 1914–15 were native grades, 2 and 3 years of age. The 41 head making up the first three lots were better steers than those used the previous year, but those of Lot 4 were "short" 2-year-olds of about the same quality as the 24 head which were fed in 1913–14.

CHARACTER AND PRICES OF FEEDS USED.

The cottonseed meal and hulls used were of the same grade as in 1913–14 and analyzed about 38.6 per cent crude protein. The corn was good, sound, white corn, and the silage was of good average quality, made from corn that would have yielded about 40 bushels per acre.

The cottonseed meal and cottonseed hulls were bought and delivered for $25 and $5.50 per ton, respectively. The corn was charged against the steers at $1 per bushel, and the corn silage was valued at $3 per acre.

METHOD OF FEEDING AND HANDLING THE CATTLE.

The same system was followed as in 1913–14, all the feeds being mixed before feeding and the steers brought gradually to a full feed.

The initial and final weights were obtained from weighings made on three consecutive days, and weights were taken every 28 days during the progress of the experiment.

QUANTITY OF FEED CONSUMED AND AVERAGE DAILY RATIONS.

The average total quantities of feeds consumed by each steer in the various lots, and the average daily rations per head by 28-day periods, also for the total feeding period, are summarized in Table 22.

TABLE 22.—*Total and average daily rations, Oct. 21, 1914, to Jan. 24, 1915, 96 days.*

Lot No.	Number of steers.	Days fed.	Ration.	Total feed consumed per steer.	Average daily ration by periods.				Average daily ration for entire period.
					First period, 28 days.	Second period, 28 days.	Third period, 28 days.	Fourth period, 12 days.	
				Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds*
1	10	96	Cottonseed meal	527	3.38	6.00	6.44	6.82	5.49
			Cottonseed hulls	2,308	21.84	25.00	25.00	25.00	24.04
			Ear corn	500	3.38	6.00	6.00	6.00	5.21
2	10	96	Cottonseed meal	711	5.17	8.00	8.64	8.68	7.41
			Cottonseed hulls	2,308	21.84	25.00	25.00	25.00	24.04
3	21	96	Cottonseed meal	711	5.17	8.00	8.64	8.68	7.41
			Corn silage	3,875	38.45	45.00	45.00	10.91	40.36
			Cottonseed hulls [1]					14.09	
4	26	111	Cottonseed meal	694	4.61	6.43	7.00	7.00	6.25
			Cottonseed hulls	2,212	18.66	21.07	20.00	[2] 20.00	19.92

[1] Cottonseed hulls were fed only the last 12 days of the feeding period.
[2] Lot 4 was fed 111 days, or 27 days during the fourth period.

Each steer in Lot 1 ate 3.38 pounds each of cottonseed meal and ear corn and 21.84 pounds of cottonseed hulls daily during the first 28 days. These amounts were increased until in the last period of 12 days each steer consumed daily an average of 6.82 pounds of cottonseed meal, 6 pounds of ear corn, and 25 pounds of cottonseed hulls. The average daily ration per head for the entire 96 days was 5.49 pounds of cottonseed meal, 5.21 pounds of ear corn, and 24.04 pounds of cottonseed hulls.

The average daily ration per head of the steers in Lot 2 was 5.17 pounds of cottonseed meal and 21.84 pounds of cottonseed hulls for the first 28-day period. During the last 12 days each steer ate on the average 8.68 pounds of cottonseed meal and 25 pounds of cottonseed

FIG. 8.—Steers finished on cottonseed meal and corn silage (Lot 3, winter of 1914–15).

hulls per day. The average daily ration per head for the 96-day fattening period was 7.41 pounds of cottonseed meal and 24.04 pounds of cottonseed hulls.

The 21 steers in Lot 3 consumed an average daily ration per head of 5.17 pounds of cottonseed meal and 38.45 pounds of corn silage during the first 28 days. The quantities were increased to 8.64 pounds of cottonseed meal and 45 pounds of silage during the third period. The supply of silage ran short, so the average daily allowance was decreased to 10.91 pounds per head during the last 12 days, and 14.09 pounds of cottonseed hulls per head were substituted, while the cottonseed meal averaged 8.68 pounds per head. The average daily ration per head for the 96 days was 7.41 pounds of cottonseed meal and 40.36 pounds of corn silage.

Each of the 26 steers of Lot 4 was fed an average of 4.61 pounds of cottonseed meal and 18.66 pounds of cottonseed hulls per day during the first 28-day period. These amounts were increased to 7 pounds of cottonseed meal and 20 pounds of cottonseed hulls for the fourth period of 27 days. The average daily ration per head for the entire period of 111 days was 6.25 pounds of cottonseed meal and 19.92 pounds of cottonseed hulls.

Table 23 gives the average initial and final weights per head, the total gains, and the average daily gain per steer.

TABLE 23.—*Total and daily gains, 1914–15.*

Lot No.	Number of steers.	Days fed.	Ration.	Average initial weight per steer.	Average final weight per steer.	Average total gain per steer.	Average daily gain per steer.
				Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
1	10	96	Cottonseed meal, ear corn, and cottonseed hulls	941	1,096	155	1.61
2	10	96	Cottonseed meal and cottonseed hulls	967	1,103	136	1.42
3	21	96	Cottonseed meal and corn silage	911	1,110	199	2.07
4	26	111	Cottonseed meal and cottonseed hulls	736	893	157	1.43

It will be seen that the average total gain per head for the steers in Lots 1 and 2 was 155 pounds and 136 pounds, respectively, which was equivalent to 1.61 pounds and 1.42 pounds per head daily. Comparing the results with those of the 1913–14 tests, it is seen that the addition of corn to the ration produced larger gains in both tests.

The steers in Lot 3 made an average daily gain per head of 2.07 pounds, or a total gain of 199 pounds for the 96 days, which is the best showing of any of the cattle. This shows rather forcibly the great value of corn silage in a fattening ration for steers, and, as will be seen later, these gains were the most economical.

The smaller steers of Lot 4, which were fed the same ration as those in Lot 2, made practically the same average daily gains, but over a longer period, gaining 157 pounds per head in the 111 days.

QUANTITIES AND COST OF FEEDS TO PRODUCE 100 POUNDS GAIN.

Table 24 shows the amount of feed that was required to produce 100 pounds of gain on the steers of the four lots, and the cost of this feed in each case.

TABLE 24.—*Quantity and cost*[1] *of feeds required to produce 100 pounds of gain, 1914–15.*

Lot No.	Number of steers.	Days fed.	Ration.	Quantity of feed required for 100 pounds gain.	Cost of feed for 100 pounds gain.
1	10	96	Cottonseed meal	340	12.96
			Ear corn	322	
			Cottonseed hulls	1,489	
2	10	96	Cottonseed meal	523	11.21
			Cottonseed hulls	1,687	
3	21	96	Cottonseed meal	357	7.60
			Corn silage	2,055	
4	26	111	Cottonseed meal	442	9.40
			Cottonseed hulls	1,409	

[1] Prices of feed used:

Cottonseed meal	$25.00 per ton.
Cottonseed hulls	5.50 per ton.
Corn silage	3.00 per ton.
Ear corn	1.00 per bushel.

This table reveals some interesting figures on the efficiency of the feeds used. Comparing Lots 1 and 2 it can be seen that the 322 pounds of corn fed to Lot 1 produced as much gain as 183 pounds of cottonseed meal and 198 pounds of cottonseed hulls. As the cost of these gains are shown in the last column to be $12.96 and $11.21 for Lots 1 and 2, respectively, it is evident that it would have been more economical to omit the corn.

The cattle in Lot 3 required only 357 pounds of cottonseed meal and 2,055 pounds of corn silage, costing $7.60 to produce 100 pounds of gain. The efficiency of this ration and its low cost are the most striking facts illustrated in the table.

The smaller steers of Lot 4 made larger gains on the cottonseed meal and cottonseed hull rations than did the steers in Lot 2. This accounts for the smaller quantities of feed, and consequently smaller cost to produce 100 pounds of gain.

It will be noticed that the gains on all the cattle were produced much cheaper than in 1913–14. This was due chiefly to the lower cost of the cottonseed meal and cottonseed hulls for 1914–15, and the fact that expensive hay was not used in the rations.

SHIPPING AND SLAUGHTER DATA.

Table 25 shows the average final farm weight per head, the market weight, the shrinkage in transit, the average weights of carcasses, and the dressing percentages.

TABLE 25.—*Shipping and slaughter data, 1913–14.*[1]

Lot No.	Number of steers.	Days fed.	Ration.	Average final farm weight per steer, Jan. 25.	Average market weight per steer at Richmond, Jan. 30.	Average shrinkage per steer in transit.	Per centage of shrinkage.	Average weight of carcass at New York, Feb. 1.	Per-centage dressed by farm weight.	Per-centage dressed by market weight.
				Pounds.	*Pounds.*	*Pounds.*	*Per ct.*	*Pounds.*	*Per ct.*	*Per ct.*
1	10	96	Cottonseed meal, ear corn, and cottonseed hulls	1,096	1,042	54	4.92	586	53.43	56.23
2	10	96	Cottonseed meal and cottonseed hulls	1,103	1,055	48	4.35	597	54.17	56.61
3	21	96	Cottonseed meal and corn silage	1,110	1,057	53	4.77	603	54.32	57.05

[1] The steers in Lots 1, 2, and 3 were shipped to Richmond, Va., and after they had taken a fill were then sold to New York buyers; no live weights were secured at the New York market. Lot 4 was sold to local butchers, but the slaughter data are not available, as the steers were not marketed at the same time.

The steers were driven 15 miles to Clyde, N. C., and held till the following morning, January 26, when they were watered and fed and then loaded on the cars. They arrived in Richmond, Va., on the night of January 28. The shrinkage was 54, 48, and 53 pounds per head for Lots 1, 2, and 3, respectively, which shows very little difference for the various lots. The steers were sold to buyers in Richmond on January 30 and shipped to New York, where they were slaughtered on February 1. The slaughter data are calculated on the market weights taken in Richmond, as no weights were secured before killing at New York. The cattle of Lot 1 dressed 56.23 per cent; Lot 2, 56.61 per cent; and Lot 3, 57.05 per cent. This indicates that the ration of cottonseed meal and corn silage will produce as desirable carcasses as the ones fed to the other steers. No differences were assigned by the packers to the carcasses from the different lots. The cattle in Lot 4 were sold locally, and the slaughter data are not available.

FINANCIAL STATEMENT.

The financial statement of the feeding and marketing of the four lots of steers is given in Table 26.

TABLE 26.—*Financial statement, 1914–15.*

Lot 1, 10 steers, fattened on cottonseed meal, ear corn, and cottonseed hulls:

To 10 steers, 9,410 pounds at $6.75 per cwt	$635.17
To 5,270 pounds cottonseed meal at $25 per ton	65.87
To 23,085 pounds cottonseed hulls at $5.50 per ton	63.48
To 5,000 pounds ear corn at $1 per bushel	71.43
Freight, Clyde, N. C., to Richmond	25.60
Feed at Spencer, N. C	2.00

Lot 1—Continued.	
Feed at Richmond, Va	$4.15
Commission charges	10.00
Total expenditures	877.70
By sale of 10 steers, 10,960 pounds at $7.75	849.40
By value of 40 tons of manure at $2 per ton	80.00
Total receipts	929.40
Total profit including manure	51.70
Total loss not including manure	28.30
Average profit per steer including manure	5.17
Average loss per steer not including manure	2.83
Lot 2, 10 steers, fattened on cottonseed meal and cottonseed hulls:	
To 10 steers, 9,673 pounds at $6.75 per cwt	652.93
To 7,115 pounds cottonseed meal at $25 per ton	81.82
To 23,085 pounds cottonseed hulls at $5.50 per ton	63.48
Freight to Richmond from Clyde, N. C	25.60
Feed at Spencer, N. C	2.00
Feed at Richmond, Va	4.15
Commission charges	10.00
Total expenditures	839.98
By sale of 10 steers, 11,030 pounds at $7.75	854.82
By value of 40 tons of manure at $2 per ton	80.00
Total receipts	934.82
Total profit including manure	94.84
Total profit not including manure	14.84
Average profit per head including manure	9.48
Average profit per head not including manure	1.48
Lot 3, 21 steers, fattened on cottonseed meal and corn silage:	
To 21 steers, 19,131 pounds at $6.75 per cwt	1,291.34
To 14,942 pounds cottonseed meal at $25 per ton	186.77
To 3,255 pounds cottonseed hulls at $5.50 per ton	8.95
To 81,375 pounds corn silage at $3 per ton	122.06
Freight, Clyde, N. C., to Richmond	51.81
Feed at Spencer, N. C	4.00
Feed at Richmond, Va	8.75
Commission charges	21.00
Total expenditures	1,694.68
By sale of 21 steers, 23,310 pounds at $7.75 per cwt	1,806.53
By value of 84 tons of manure at $2 per ton	168.00
Total receipts	1,974.53
Total profit including manure	279.85
Total profit not including manure	111.85
Average profit per head including manure	13.33
Average profit per head not including manure	5.33

Lot 4, 26 steers, fattened on cottonseed meal and cottonseed hulls:	
To 26 steers, 19,130 pounds at $6 per cwt	$1,147.80
To 18,054 pounds cottonseed meal at $25 per ton	225.67
To 57,525 pounds cottonseed hulls at $5.50 per ton	158.19
Total expenditures	1,531.66
By sale of 26 steers, 23,230 pounds at $7 per cwt	1,626.10
By value of 104 tons of manure at $2 per ton	208.00
Total receipts	1,843.10
Total profit including manure	302.44
Total profit not including manure	94.44
Average profit per steer including manure	11.63
Average profit per steer not including manure	3.63

When the cattle are credited with $2 per ton for the manure produced, the steers in Lot 1 returned a profit of $5.17 per head; those in Lot 2, 9.48 per head; Lot 3, $13.33 per head; and Lot 4, $11.63 per head. It will be seen that the steers in the first three lots cost the same per hundredweight and were sold for the same price per hundredweight. This allows direct comparison of the profits shown to the gains made and the cost of same.

The silage-fed steers of Lot 3 made the largest and cheapest gains and returned the largest profit. Those in Lot 1 made the next largest gains, but these gains cost more than on the cattle in Lot 2, so the profit on them was the smallest of the three.

Although the steers of Lot 4 made gains at the same rate as those of Lot 2 and were fed the same ration, their gains were made more cheaply, as shown in Table 24. They also returned a larger profit, even though they sold for 75 cents less per hundredweight.

SUMMARY STATEMENTS OF THE WINTER FATTENING TESTS.

WORK OF 1913–14.

1. The cattle used in this test were all native grade cattle, averaging 2 years of age.

2. The 24 steers were divided into two lots of 12 each and fed as follows:

Lot 1. Cottonseed meal, cottonseed hulls, corn stover, and hay.
Lot 2. Cottonseed meal, ear corn, cottonseed hulls, corn stover, and hay.

3. At the beginning of the test the steers in Lot 1 had an average weight of 819 pounds, and after 113 days on feed weighed on the average 973 pounds, showing a gain of 154 pounds per head, or an average daily gain per steer of 1.36 pounds.

The average initial weight of the steers in Lot 2 was 823 pounds and the final weight 983 pounds, which shows a gain of 160 pounds per head, equal to 1.42 pounds per head daily.

4. The cost of producing 100 pounds gain in Lot 1 was $13.32; and in Lot 2, $13.92.

5. The cattle as feeders cost $5.50 per hundredweight in the fall. A margin of $2.10 per hundredweight was realized when they were sold on the Baltimore market the following spring at $7.60 per hundredweight for both lots.

6. The average profit per steer, including the value of the manure produced, was $6.33 and $5.44 for Lots 1 and 2, respectively. When the manure was not included there was a loss of $1.67 per head in Lot 1 and $2.56 per head in Lot 2.

WORK OF 1914–15.

1. The cattle used in Lots 1, 2, and 3 were good grade native 2 and 3 year old steers. Those composing Lot 4 were native grades averaging a little short of 2 years old and were classed as plain steers.

2. The steers were divided into four lots and fed as follows:

Lot 1, 10 steers, fed cottonseed meal, ear corn, and cottonseed hulls.
Lot 2, 10 steers, fed cottonseed meal and cottonseed hulls.
Lot 3, 21 steers, fed cottonseed meal and corn silage.
Lot 4, 26 steers, fed cottonseed meal and cottonseed hulls.

3. At the beginning of the experiment the average weights per head were: Lot 1, 941 pounds; Lot 2, 967 pounds; Lot 3, 911 pounds; and Lot 4,736 pounds. After feeding 96 days the final weights for the steers average 1,096 pounds, 1,103 pounds and 1,110 pounds, respectively, for Lots 1, 2, and 3. These steers in Lot 4 were fed 111 days and weighed 893 pounds per head at the conclusion of the experiment. Thus the total gains per head were 155 pounds for Lot 1, 135 pounds for Lot 2, 199 pounds for Lot 3, and 157 pounds for Lot 4, making an average daily gain per head of 1.61 pounds, 1.42 pounds, 2.07 pounds, and 1.43 pounds for Lots 1, 2, 3, and 4, respectively.

4. It cost $12.96 to produce 100 pounds of gain in Lot 1; in Lot 2, $11.21; in Lot 3, $7.60; and in Lot 4, $9.40.

5. The cattle in Lots 1, 2, and 3 cost $6.75 per hundredweight in the fall as feeders, and all sold for $7.75 per hundredweight at Richmond the following spring. The steers in Lot 4 cost $6 per hundredweight in the fall and sold for $7 per hundredweight on the local market.

6. After crediting the steers with the manure produced, the average profit per head was as follows: Lot 1, $5.17; Lot 2, $9.48; Lot 3, $13.33; and Lot 4, $11.63. When the manure is excluded there was a loss on Lot 1 of $2.83 per head, a profit on Lot 2 of $1.48 per head, a profit on Lot 3 of $5.33 per head; and a profit on Lot 4 of $3.63 per head.

CONCLUSIONS FROM THE TWO YEARS' FATTENING EXPERIMENTS.

It must be understood that these conclusions should be interpreted by the reader to apply to feeding operations affected by conditions such as surrounded the tests just reported.

1. The use of hay valued at $15 or more per ton for fattening steers increases the cost of gains very materially, as is shown by the first year's work. Cheaper roughages should be used if possible.

2. Cottonseed meal, even in moderate amounts, is very efficient in fattening steers, and the feeder usually can afford to buy it for this purpose if the other conditions are favorable.

3. The addition of ear corn to the ration increases the gains and the finish of steers, but unless it can be raised or purchased for considerably less per ton than cottonseed meal, its use in quantities is not advisable. If a farmer grows his own corn and is feeding steers, its use in the steers' ration as at least a part of the concentrate allowance is desirable if market price will permit.

4. Cottonseed meal and cottonseed hulls produce very satisfactory and economical gains when purchased at reasonable prices, such as was the case in these tests.

5. The remarkable efficiency and economy of corn silage in the ration of fattening steers is the most striking conclusion shown by the tests. Much more feeding could be done profitably in the region under discussion if more farmers would put their corn crops in silos and feed it in this form with cottonseed meal.

6. The heavy shrinkage in transit by the finished steers shows that the farmers in these sections must market their fat cattle under this disadvantage.

7. A study of the financial statements and costs of gains reveals many of the factors which affect the outcome of feeding operations. In calculating the profit or loss from feeding steers, the farmer should not overlook the value of the manure produced.

8. Farmers who can raise some surplus feed, especially roughages, should feel safe in feeding steers in the winter, provided they can buy feeders and cottonseed meal right and are not too far from a shipping point. If they can raise corn, it can be utilized with best results by feeding it as silage with or without other available roughages, cottonseed meal furnishing the chief concentrate to be fed with it. By so doing and using the manure on the land the productive capacity of the soil will be greatly increased.

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